THE JOURNAL

OF THE

ANTHROPOLOGICAL INSTITUTE

OF

GREAT BRITAIN AND IRELAND.

FEBRUARY 12TH, 1895.

E. W. BRABROOK, Esq., F.S.A., *President, in the Chair.*

The Minutes of the last Meeting were read and signed.

The presents that had been received were announced and thanks voted to the respective donors.

The PRESIDENT drew attention to the work of the Ethnographic Survey Committee of the British Association for the Advancement of Science, on which the Institute was represented by Mr. Francis Galton, Dr. Garson, and himself, and the Society of Antiquaries, the Folk Lore Society, the Royal Statistical Society, the Royal Irish Academy, the Cambrian Archæological Society, and other bodies were also represented. He said the committee had been successful in obtaining a long list of places suitable for the survey, and had prepared an octavo pamphlet, of twelve pages only, which gave comprehensive instructions to those who were willing to engage in it. These instructions related to physical observations, the taking of photographs, the folk lore of various districts, difference in dialect, and historic evidences of continuity of race. What the committee now desired was to increase the number of observers, and he appealed to the members of the Institute for assistance in this respect. The committee were especially anxious to induce medical men to interest

themselves in obtaining the necessary physical measurements in suitable places, though the instructions provided had been made clear and simple enough to enable any person to do so, who had the use of the few instruments required. For this purpose, they would be glad to furnish instruments, and render any other assistance that might be necessary and practicable. The other branches of the enquiry were also being proceeded with as opportunity offered. All their experience had shown them how valuable the results of their work would be likely to be, and how desirable it was that it should be carried to a successful issue without any delay that could be avoided.

The following papers were read:—

"Prehistoric Remains in Cornwall." Part I. By A. L. LEWIS, Esq., F.C.A.

"On the Northern Settlements of the West-Saxons." By Dr. JOHN BEDDOE, F.R.S.

PREHISTORIC REMAINS *in* CORNWALL.

By A. L. LEWIS, F.C.A.

[PLATES I, II.]

Part I.—*East Cornwall.*

THE prehistoric remains of Cornwall have been the theme of so many archæological books and papers that it might well be thought that nothing remained to be said about them, especially since the publication by the Society of Antiquaries of the elaborate plans prepared by the Rev. W. C. Lukis and Mr. W. C. Borlase; but even this work, exhaustive as it appears to be, omits all mention of two large and important circles, and of another large and almost unique monument which I shall describe in the course of the present paper. Warned by the shortcomings of my predecessors, I shall not venture to suppose that I have to-day said the last word upon this apparently inexhaustible subject, but I shall be quite prepared to hear at any time that some more fortunate person has discovered something that has escaped my own notice as well as that of the more celebrated antiquaries who have preceded me.

The first monuments I propose to draw your attention to are the three circles called the "Hurlers," which are 4 or 5 miles north from Liskeard and half a mile south from the curious natural pile of granite called the "Cheesewring." They were most accurately surveyed by Mr. C. W. Dymond in

1877, and his description and plan are in the "Journal of the British Archæological Association" for 1879, and they were also measured in 1879 by Messrs. Lukis and Borlase, whose plans and description will be found in the work published by the Society of Antiquaries. These three circles are in a line extending over about 530 feet and averaging about 15 degrees east of north, but the direction of the line from the centre of the south circle to that of the middle circle is 12 degrees east of north, while the line from the centre of the middle circle to that of the north circle is 18½ degrees east of north. The three circles at Stanton Drew, near Bristol, are arranged in a similar manner, though the bearings are not quite the same. Mr. Dymond gives the diameters as 114, 140, and 108 feet for the north, middle, and south circles respectively: Mr. Lukis states them at 110, 135, and 105 feet only, but this difference may be attributed to the condition of the circles, which is very ruinous, there being only eighteen stones standing and nineteen fallen out of a total of seventy-five in the three circles, as estimated by Mr. Dymond. Their destruction has continued to quite recent times, for I found a stone in the northern circle in 1869 which Mr. Dymond also found there in 1870, but did not find in 1877, when he completed his plan, but which he has inserted therein with a note reporting its disappearance. Messrs. Lukis and Borlase who followed him in 1879 of course did not find the stone, and it does not appear in their plan. Mr. Tregelles who visited these circles in 1894 reports the disappearance of one if not two stones which Mr. Dymond found in the southern circle. About 400 feet from the middle circle, in a direction 21 degrees south of west from its centre, but in a line with its southern edge, are two stones about 5 feet high. The stones composing these circles are from 3 to 6 feet high and 1 to 3 feet broad and thick. The most remarkable object seen from the circles is the "Cheesewring" hill, which is 4 degrees west from north, and stands up on the sky-line in a manner which occurs so frequently in connection with the Cornish circles and the most prominent hills around them, as to cause an impression that the position of the circles was selected with a view to the effect to be produced by the hills.

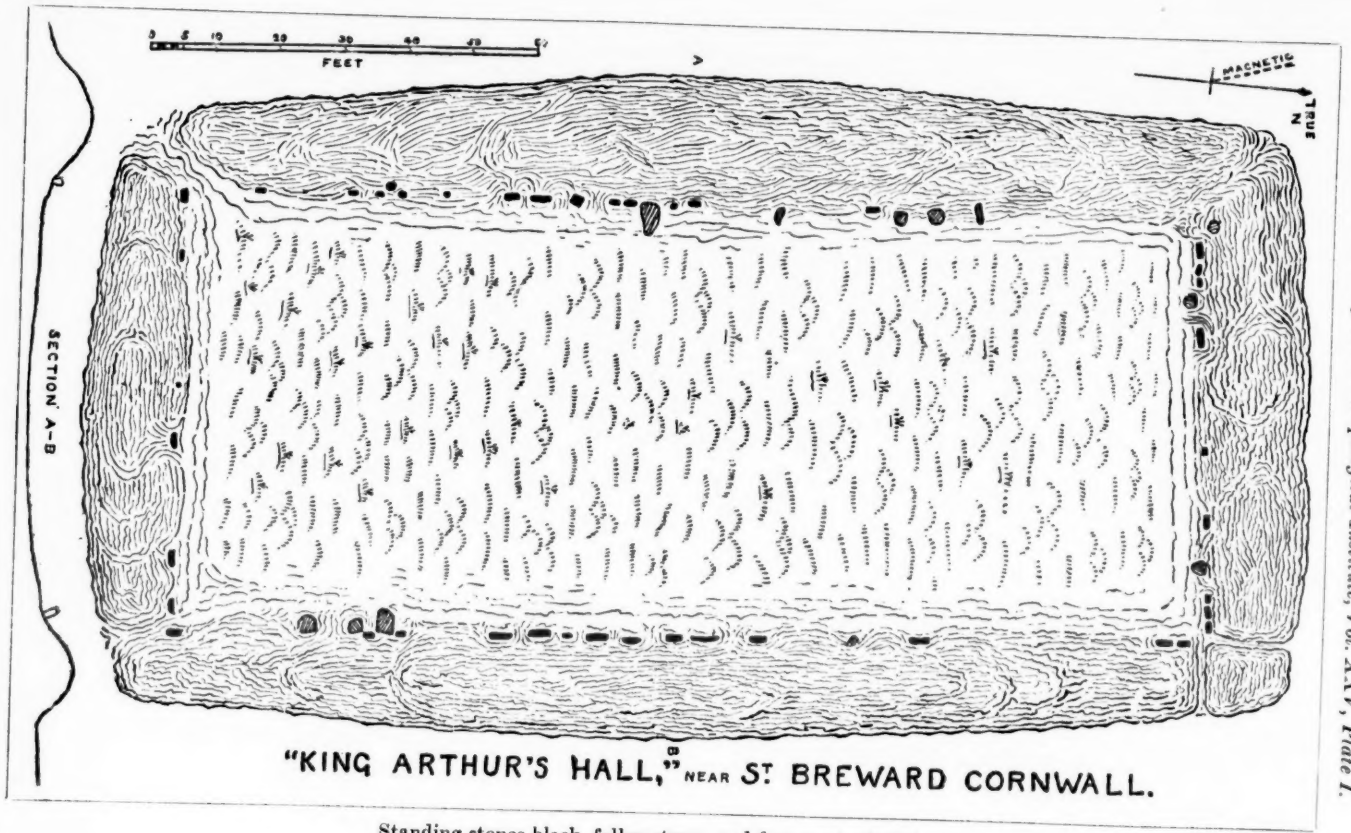
Between the Hurlers and Liskeard is the Trethevy Stone, a dolmen forming a complete chamber, but standing not in but on a mound, from 2 to 3 feet high, which makes it difficult to believe that the dolmen was ever either covered or intended to be covered. There are seven upright stones supporting a capstone, 15½ feet by 10 feet, at a maximum height of 10 feet from the floor of the interior; the capstone has a small hole at the upper end, which was probably cut to receive a cross at a

period long after the erection of the dolmen. This monument was first described by Norden in or about 1584 A.D., and is figured by Mr. Dymond in the "Journal of the British Archæological Association" in 1879–80, and by Messrs. Lukis and Borlase in the work published by the Society of Antiquaries.

Dozmare Pool, round which large numbers of flint flakes have been dug up, is about 5 miles west from the "Hurlers." The flint appears to have been brought from Devonshire and made into implements, etc., at this place. There are also some single stones and other remains about the district.

At Duloe, 4 miles south from Liskeard, there is a small circle, consisting of eight large stones, the largest of which has been thrown down and broken. They vary from 3 to 11 feet high, 2½ to 6½ feet broad, and from 1½ to 4 feet thick. I have not seen this circle myself, but it has been described and planned by Mr. Dymond in the "Journal of the British Archæological Association" and by Messrs. Lukis and Borlase in the work published by the Society of Antiquaries. Mr. Dymond says the diameters are from 34 to 39 feet, Mr. Lukis says the diameter is 36½ feet, so perhaps he took the average. A small urn and other appearances of interment, which, however, may very well have been post Roman, have been found in the circle, and Mr. Lukis accordingly thought the circle was "probably the enclosing ring of a cairn which has been entirely removed." This is an ordinary formula, but why so many cairns should have been entirely carted out from their enclosing rings as some archæologists would have us believe is by no means clear. Mr. Dymond says "Mr. Borlase now (1882) thinks it improbable that there was a tumulus within or near to the Duloe circle."

The most important and the least visited collection of monuments in Cornwall is situated on Bodmin Moors, clustering round Brown Willy, Rough Tor, Garrow, and Hawk's Tor. The two former are the highest points in the county, and on their slopes are great numbers of ruined huts and enclosures constructed of unshaped blocks of stone without mortar, and also some small sepulchral circles, cists, etc. Amongst them is one perfect hut which was described by the Rev. S. Baring-Gould in the "Daily Graphic" of 4th September, 1891. Although there is no absolute proof that these huts and circular enclosures were the dwellings of the people who constructed the circles of separate upright stones which stand in their vicinity it seems most probable that they were, and that all belong to the same period, and, if we may judge of the Cornish huts from the results of the recent excavations in the huts at Grimspound and elsewhere on Dartmoor, that period must be a very early one.



Standing stones black, fallen stones and fragments shaded.

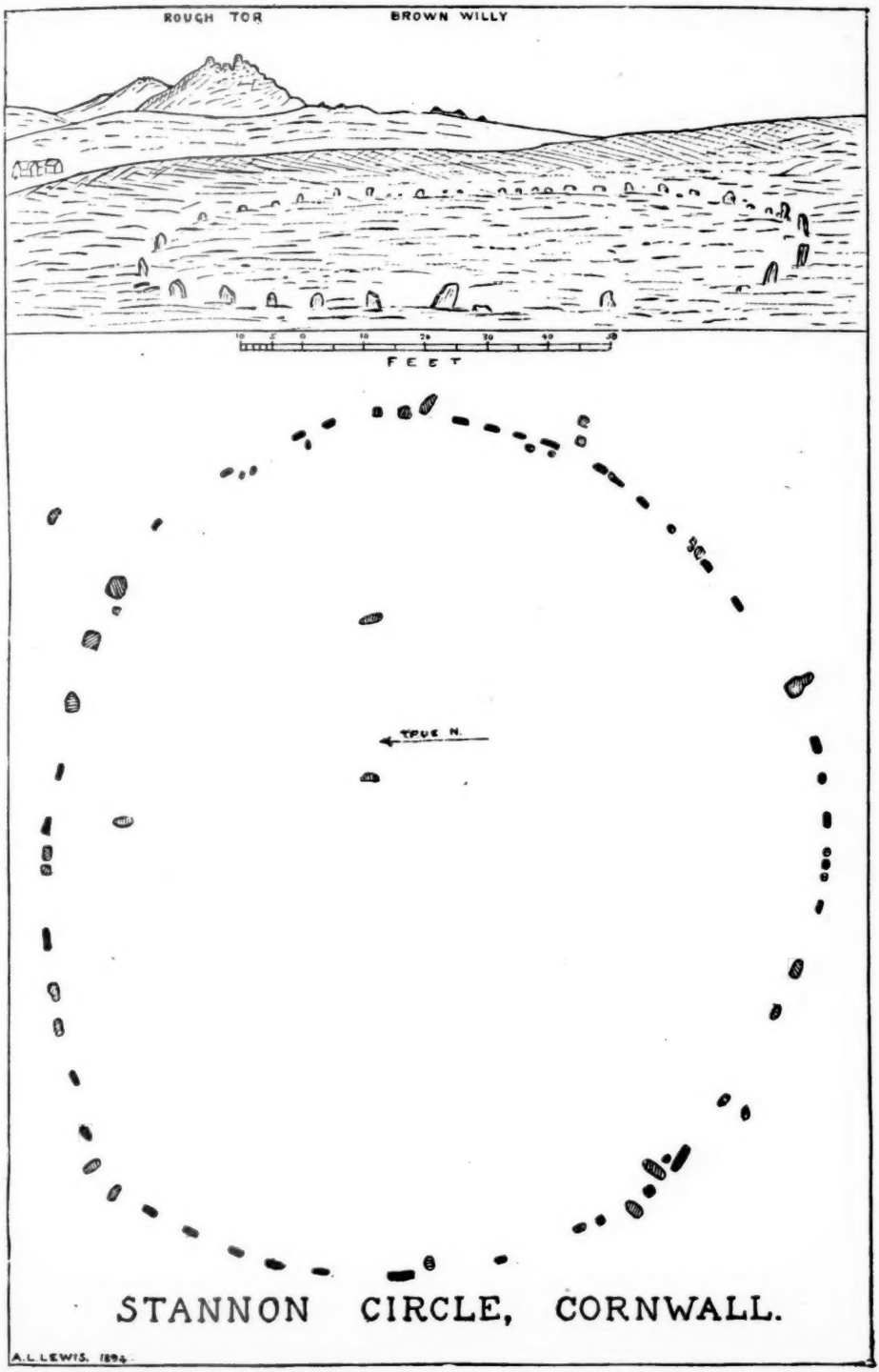
No one who sees the hut circles and enclosures side by side with the open stone circles, as they are on these moors, can doubt for a moment which class any one of them belongs to, and it is important to note this at a time when attempts are being made to induce people to believe that Stonehenge has been roofed, and is only the skeleton of a dwelling of the Mediterranean type, and that the inner circles at Abury, though over 200 feet in diameter, were something of the same kind.

A very peculiar, I might say unique structure on Bodmin Moors is known as "King Arthur's Hall." It consists of a bank of earth, the present breadth of which varies from 12 to 20 feet at the base, its height varying from 5 to 7 feet; this bank encloses an oblong space, 159 feet long from north to south (within 5 degrees to west of north), 64 feet wide at the north, and 68½ feet wide at the south. Twelve stones stand or lie in line inside the north end of the bank, eighteen inside the east side, six inside the south end, and nineteen inside the west side. They seem to have formed a kind of retaining wall to the inner side of the bank, but are mostly pressed inward by its weight, and some are nearly buried by its gradual wearing away. These facts, coupled with the probability that the lines, if not absolutely continuous, were originally much more complete than they are now, lead me to suppose that several stones may be quite covered, but this can only be ascertained by digging or boring. The largest stones remaining in position are about 5 feet high. The middle of the enclosure is a foot or two lower than the ground outside, and is full of water, which finds a vent at the south-west corner. All the corners of the embankment are more or less broken and rounded, and it is lower at the north and south ends than at the east and west sides, but there is no appearance of any special entrance, the angles of the lines of stones being well defined, except, perhaps, at the south-west corner. Rough Tor, Brown Willy, and Garrow, form a trinity of hills covering 30 degrees of horizon, 15 on each side of the north-east; Hawkstor is south-east. This extraordinary monument, the purpose of which it is difficult to imagine, is neither planned nor mentioned in the work on Cornish rude stone monuments by Messrs. Lukis and Borlase, published by the Society of Antiquaries; it has a slight resemblance to two enclosures in Brittany described by Admiral Tremlett in the "Journal of the Anthropological Institute" for November, 1885, the entrance to each of which was at a corner. These appeared to have been used as places for cremation, but we have no evidence as to the use of "King Arthur's Hall."

There are upon these moors five circles, from each of which Rough Tor is seen as a most conspicuous object, and of the five circles two stand in a line with it, nearly due north and south, and two others in another line with it, 11 to 12 degrees east of north; two of the circles are also in line with Brown Willy nearly due east from them. The distances between the circles taken on the level on the 6-inch ordnance map show remarkable proportions to each other, and these peculiarities of positions and distances seem to make it probable that the circles, though far and mostly hidden from each other, were all erected as part of one great scheme, a subject which I will revert to after briefly describing the circles themselves.

The Fernacre Circle, the most north-easterly of the group, was very probably the first to be erected. It stands on sloping ground, with Brown Willy nearly due east, Rough Tor due north (not west-north-west, as Mr. Lukis has said), and Garrow due south, all standing up boldly around it. As Mr. Lukis had published a fully detailed plan, and as the time at my disposal was short, I did not measure it. He said it consisted in 1879 of ten fallen and forty-five erect stones, some of which were very small, and some between 3 and 4 feet high, and he thought they had sunk or become overgrown. I doubt whether this be the case to any great extent, still Mr. G. F. Tregelles found forty-five stones standing and "nineteen almost disappearing in the peaty soil" in 1893, and the nine which he found and which Mr. Lukis did not find may have become visible by a shrinking of the turf. Mr. Lukis says the diameter of this circle is 140 feet, but his own plan shows it to be 146–7 feet, and, on checking his stated measurements to ascertain the exact diameter, I found that three of them were not correctly laid down on his plan, the effect of which is to misplace one of the stones by about 4 feet. There is a small outlying stone about 160 feet east from the circle, directly in line with the highest peak of Brown Willy, and this fact, together with the position of the circle relatively to the three hills and to the Stannon and Stripple Stones circles, leads me to suppose that, if the distances between the circles were really measured, this was the circle from which the measurements to the others were taken.

The Stannon Circle, the most north-westerly of the group, is the nearest to the Fernacre Circle, and is in a direct line with it and Brown Willy, and also with the small outlying stone to the east of the Fernacre Circle, and was therefore, perhaps, the second in order of construction. It consists of about seventy stones and fragments, of which thirty-three are upright, but none of them exceed 5 feet, and some are not more than 2 feet in height. The diameters of the ring are 138 feet from east to



Standing stones black, fallen stones and fragments shaded.

west and 125½ feet from north to south, there being a peculiar flattening of the northern side, in which respect it resembles Long Meg Circle in Cumberland. Rough Tor, a little more than a mile distant, and ranging from 20 to 24 degrees north of east, is by far the most conspicuous object seen from it, and its granite carn, showing two peaks with a lower one between, would present a very remarkable appearance if the sun framed itself between them, as it probably does at some time in the year. Brown Willy is almost entirely hidden by a ridge of no great height, which also conceals Garrow and the Fernacre Circle entirely, but, looking due east, three of the peaks of Brown Willy may be seen peeping above the ridge and forming a triple summit, an appearance which I have noticed in connection with several other circles. The Stannon Circle is neither mentioned nor figured by Messrs. Lukis and Borlase in their work published by the Society of Antiquaries.

The Stripple Stones Circle is at the south-east angle of the space marked out, so to speak, by the position of the circles. It is on the south-eastern slope of Hawkstor, and looking due north from it the top of Rough Tor will be seen over Garrow, the Fernacre Circle being in the same line but out of sight in the hollow between them. This circle differs from all the rest in being surrounded by a ditch, 11 feet wide, with a low bank of about the same width outside it; there is but one entrance, which opens exactly in the direction of the Trippet Stones Circle, about 13 degrees south of west, but there are three semi-lunar projections in the vallum (W.N.W., N.N.E., and E.) Mr. Lukis stated the diameter of the circle to be 148½ feet, but it is doubtful from his own plans whether it is not 2 feet less, exactly the same as that of the Fernacre Circle. A stone, 12 feet high, stood in the centre, but is now fallen, as are twelve of those left of the circle, there being only four standing, which are from 4 to 6 feet high.[1] One of the fallen stones was 12 feet long, but if now in its original position, must have stood outside the circle, but inside the ditch and vallum. The original number of stones composing the circle itself, was, in Mr. Lukis's opinion, 37, but Mr. Tregelles thinks the number to have been more probably 28, which also seems to me more in accord with Mr. Lukis's own measurements. At a short distance[2] from the eastern side of the circle there is a small barrow with a central cist. Hawkstor is 60 degrees

[1] There were five standing when Mr. Lukis made his plan in 1879, but Mr. Tregelles found only four standing in 1893.

[2] Mr. Lukis says 232 feet, Mr. Tregelles says 110 feet. I did not measure the distance myself, in 1891, as there is no apparent connection between the barrow and the circle.

north of west from this circle; Rough Tor and Garrow are in line due north, Brown Willy covers from 15 to 18 degrees east of north, and a trinity of lower hills extends from 35 to 65 degrees east of north.

The Trippet Stones Circle is at the south-western angle of this group of four circles, and is the smallest of them, its diameter, according to Mr. Lukis, being 104 feet 7 inches. When I visited it in 1891 there were eight stones standing and four fallen, one of which had fallen since Mr. Lukis made his plan in 1879, and, as they were all surrounded by pools of water, the downfall of some of the others may be confidently expected. The height of these stones varied from 4 to 5 feet, an additional foot or so being sunk in the ground. The interval of about 12½ feet from centre to centre, which seems very regular between the remaining stones, would indicate their original number to have been twenty-six or twenty-seven. There is a small stone inside the circle, but it is a modern boundary stone, and there is another a short distance due east. Two stones are in a north-westerly line from the (outer S.E.) edge of the circle to Carbilly Tor, a very inconsiderable eminence. Rough Tor and Brown Willy form with Hawkstor a trinity of hill-tops extending from 12 to 62 degrees east of north.

The Leaze Circle is situated nearly in the middle of the trapezium of which the other four circles form the corners, but is not visible from any of them, and does not appear to have any relation to any of them except that it is in the same line from Rough Tor as the Trippet Stones Circle. It consists at the present time of ten stones standing and one fallen; they are from 3 to 4 feet high and one to two and a half in width and thickness, there are also four or five fragments, three of which are buried in a fence which cuts the circle in halves. The diameter of the circle appears to have been 83½ feet, but its south-eastern segment is wanting. Rough Tor is on the whole the most conspicuous hill, and covers the horizon from 10 to 20 degrees east of north; Garrow extends from 30 to 40 degrees east of north, and hides Brown Willy; Butter's Tor makes a third eminence at about 30 degrees north of east; Catshole Tor is 24 degrees north of east, and Hawkstor 73 degrees south of east. There are some outlying stones about 10 degrees east of north which may however have formed part of a cist, and there are what appear to be the remains of another circle a short distance to the north-west, between the Leaze Circle and King Arthur's Hall. None of these remains are mentioned or figured in the work by Messrs. Lukis and Borlase published by the Society of Antiquaries.

I have already mentioned that there is a remarkable propor-

tion between the distances of four of these circles from each other; the distances are, as nearly as can be ascertained from the 6-inch ordnance map:—

Fernacre to Stannon	6,275 feet	=	3,000 cubits of 25·1 inches.
Stannon to Trippet Stones ..	16,400 „	=	7,840 „ „ „ (for 8,000 cubits.)
Trippet Stones to Stripple Stones	4,180 „	=	1,998½ cubits of 25·1 inches. (practically 2,000.)
Stripple Stones to Fernacre ..	15,730 „	=	7,520 cubits of 25·1 inches. (practically 7,500.)
Fernacre to Trippet Stones ..	16,880 „	=	8,070 cubits of 25·1 inches. (for 8125.)
Stannon to Stripple Stones ..	16,850 „	=	8,055 cubits of 25·1 inches. (for 8125).

The Leaze Circle may have been intended to be at the crossing of the diagonal lines from Fernacre to Trippet and from Stannon to Stripple, but is about 700 feet north of that point—perhaps the original intention was varied in order to get the Leaze Circle in a particular line with Rough Tor.

The diameters of the circles are:—

Fernacre	146–7 feet	=	70 cubits of 25·1 inches.
Stannon	138 „	=	66 „ „ „
	125½ „	=	60 „ „ „
Trippet Stones ..	104 ft. 7 ins.	=	50 „ „ „
Stripple Stones ..	146–7 feet	=	70 „ „ „
Leaze	83½ „	=	40 „ „ „

The cubit of 25·1 inches, which Professor Flinders Petrie calls an Egyptian or Royal Persian cubit, has been found by him at Abydos in work of the 19th dynasty (say 1300 B.C.), and it is hardly likely that the circles are anterior to that date. If this cubit were not really used as a measure in the construction of these circles it is very remarkable that their diameters should all be divisible by an even number of such cubits, and it is no less surprising that the distances between the four circles should also be an even number of them within the working error of one per cent. which Professor Flinders Petrie has found to be characteristic of ancient British work.[1] The fact that these distances are in the proportion (within one per cent.) of 2, 3, 7½, 8, and 8⅛ seems to indicate that some measure was used in setting them out, but we must remember that the aforesaid distances are measured as on the level, while the ground is particularly irregular. If, however, the constructors of the circles wished to arrange them as they appear on the map, I think they might have done it in this way:—firstly, they might have determined a straight line, by the aid perhaps of the hills and the stars, and have marked it out with wooden

[1] The distance from the Stannon circle to the Trippet Stones is more than one per cent. in error.

pegs; and secondly, they might have measured their distances along the lines marked out by means of two light planks of, say 10 cubits' or 20 feet 11 inches' length, which might have been placed end to end, and moved alternately, and kept level by means of plummets when going up or down hill; and in support of this suggestion I may point out that the greatest errors occur, as might be expected under such circumstances, in the longest distances, which are also those which cover the most difficult part of the ground, the shorter distances, namely from Fernacre to Stannon and Trippet Stones to Stripple Stones, being almost exact, as are the diameters of the circles. It may perhaps be said that, although the method of measurement I have suggested would not be beyond the power of the uncivilised people who lived in the stone huts and probably erected the stone circles, it would only be thought of by some one who was accustomed to the works and ways of a higher state of civilisation. But the use of an oriental measure indicates intercourse of some kind with a more civilised people, while the fact that the 25·1 inch cubit does not, so far as I have been able to find at present, appear in connection with any other circles seems to suggest that that intercourse may have been of a casual rather than of a frequent character. It seems therefore not unreasonable to suppose that someone from some country bordering on the Mediterranean may have visited Cornwall, perhaps three thousand years ago, as a merchant, explorer, or refugee, or possibly as a slave kidnapped and carried thither for sale, and that, being there, he was employed by the local chief in the construction of his public works.

If, however, the apparent use of the 25·1 inch cubit and the seemingly proportionate distances between the circles are purely accidental coincidences, and if the circles are to be regarded as having been erected independently and without reference to each other, the fact that two of them—Fernacre and Stannon—were placed (independently) in one line with Brown Willy, nearly due east; that two of them—Fernacre and Stripple Stones—were placed (independently) in one line with Rough Tor and Garrow, nearly due north and south; and that two others—Trippet Stones and Leaze—were placed (independently) in another line with Rough Tor, 12 degrees east of north, seems very difficult to explain, except upon the hypothesis that the builders of the circles did intentionally place them in such a position that the hills should be in those particular directions from them. This hypothesis is also supported by facts observed by me in Wales, Shropshire, and Cumberland and already recorded in the "Journal of the Anthropological Institute."[1]

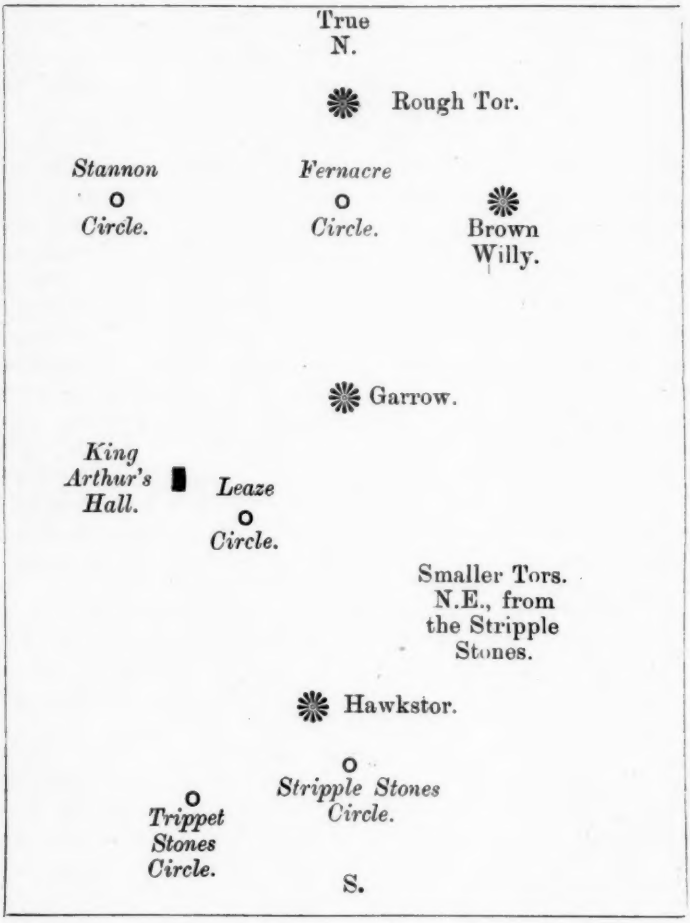
[1] Nov. 1877, Nov. 1881, May 1886.

There are, however, some present to-night who are not acquainted with the contents of our Journals of former years, and for their information, I may perhaps be permitted to add a few words upon the apparent connection between the circles and the hills, and upon the probable purpose of that connection.

When I first began the investigation of these subjects, nearly thirty years ago, I was duly impressed with the well known fact that persons standing on the so-called altar at Stonehenge, at sunrise, on the longest day, see the sun rise over the point of the outlying stone called the "Friar's Heel," and with the deduction not only from this circumstance, but from the arrangement of the inner part of Stonehenge itself, that that monument was constructed with a special reference to the rising sun at mid-summer; but it appeared to me that, if this were so, some similar arrangement should be found in connection with other large circles, and when inspecting such other circles I looked for and generally found something of the kind. Sometimes it was an outlying stone, sometimes a complete circle or circles, sometimes an inner sanctuary opening in the north-easterly or midsummer sun rising direction, and latterly I found that in hilly countries a hill-top often seemed to take the place of the outlying stone; that is to say a circle was so placed that there was a hill to the north-east of it, over the top of which the sun would probably rise at midsummer. I also found that to the north-east there was often a group of three hills, and to the north-west or south-west a single summit only, and I found recorded various instances in which other temples appeared to have been specially placed in reference to the rising sun, and to hills or mountains which, although not amounting to actual evidence, made it appear still more probable that our own circles had been designed in a similar manner.

There was, however, this difficulty, that, while an outlying stone or hill anywhere between north-east and south, and north-west and south, might be connected with the sun at some period of the year, nothing north of north-east or north-west could be supposed to have any such connection, and that, in some cases, the outlying stone or hill was more to the north of the circle than could readily be explained by the solar theory. For some time I could only suppose that in such cases the first appearance of light was looked to rather than the appearance of the sun itself (for which there is good precedent), or that the placing of the outlying stone or stones had become rather conventional. These explanations I still think may apply in some cases, but not in all.

About three years ago, Professor Norman Lockyer published a series of articles in "Nature" (since reprinted as a separate volume), in which he showed that, while many of the Egyptian temples were constructed as observatories to verify the position



Sketch Plan, measured from the ordnance map, scale 1 inch to 1 mile, showing positions and distances of circles and hills on Bodmin Moors.

of the rising sun at a certain period of the year, others were constructed with special reference to the pole-star of the period, and Mr. Penrose has since found similar conditions amongst the early Greek temples. It therefore seems probable that some of our own circles, which have skymarks in the shape of hills or stones to the north rather than to the north-east or east, were designed with reference to the pole-star or some other northern star instead of to the sun; although, unlike the Egyptian temple, which could only be used as an observatory for one point, the circle might serve as a centre for the observation of both sun and stars by the various marks on the skyline in different directions formed by stones or hill-tops. Thus, some of the circles on Bodmin Moors, which I have just described, have hills to the north-east, some to the north and north-east, and some to the east and north or north-east, so that they might have been used in the worship or observation of different heavenly bodies, or at different seasons, as is the case with the various temples of the Chinese state religion around Pekin.

Sir Austen Layard, in his account of his discoveries at Nineveh (1852), describes a visit to the Yezidis or so called Devil-worshippers of Mesopotamia, who are a sun-worshipping or at least sun-reverencing sect; he also mentions the Sabæans of the same country, of whom he says:—"They turn during prayer according to some to the north star, or according to others towards that part of the heavens in which the sun rises," from which I infer that they turn sometimes to one and sometimes to the other, just as I suppose the builders of the Cornish circles to have done. Sir Austen Layard had not apparently at that time any personal knowledge about the Sabæans, but the "Standard" of 19th October last contained a long account of their rites by some one who, it would seem, had been present at their nocturnal ceremonies. According to this writer the Sabæans erect a temporary oblong tabernacle open to the sky, and some other structures, near a river, on a certain evening in September, which is the beginning of their year. The chief priest enters at the south end and faces the pole-star, which they consider to be the paradise of the elect and the abode of the pious hereafter. Processions and other ceremonies are begun at midnight and carried on almost until daylight; these ceremonies include the sacrifice of a pigeon and a sheep, and the eating by the worshippers of a cake marked with the blood of the sacrifice; also the letting loose of a live pigeon, I presume on the same principle as the release of the scape-goat by the Israelites.

I have already shown that the position of some of our own circles with regard to the surrounding hills and the pole-star

is such as to make it probable that ceremonies of a somewhat similar description may have been performed in them.

Discussion.

Mr. T. V. Holmes hoped Mr. Lewis would, in his reply, give rather more fully the evidence tending to show that the unit of measurement used in the construction of these circles was a cubit; for it seemed to him at that moment that the unit might have been a spear-length or any other conceivable measure. He thought the Institute was to be congratulated on the full and careful way in which Mr. Lewis had studied the topography of the places in which these circles existed—a matter much neglected by the old fashioned antiquary.

Prof. Rupert Jones asked for the author's opinion as to the studied aspect of bifid and trifid rocks or mountain-tops mentioned as being visible from the circles. He was glad that the intentions of the builders of these very ancient structures were still being subjected to careful research. How far the special opinions by Bryant and others as to the probable religious (Arkite) intention of their construction were to be upheld or not further research would prove.

Mr. Laurence Gomme said that although as a visitor he did not know Mr. Lewis was going to read a paper on stone circles, he had read all Mr. Lewis's previous papers, and perhaps therefore one or two matters of criticism might not be out of place. In the first place he noted that Mr. Lewis was anxious to fix the date of the circles and the religion that they indicated before he had attempted to fix upon the people who had built these monuments. Surely this latter was the first stage in the inquiry. Mr. Lewis had most appropriately pointed out the sites of prehistoric dwelling-places on the neighbouring hills and it at once raised the question whether the relationship between these dwelling-places and the circle was not determined by the natural topographical details of the country rather than by abstruse calculations on the solar system. One further question was also raised by this important factor. He, the speaker, well remembered a remarkable study by the late Mr. Topley which appeared in the Journal of the Institute, wherein it was pointed out that the Teutonic settlement always proceeded upon the plan of placing the villages in the valleys and sending the cultivation grounds up the sides of the hills. This was in direct opposition to the evidence now adduced by Mr. Lewis, where the residences were at the top of the hills with cultivation grounds no doubt in the valley. Here then was an indication of a different and more primitive race of people. Now, we know fairly well the territory occupied by the stone circles, the races occupying this territory and examples of races still erecting stone circles. This was the source in the speaker's judgment from which to ascertain the religious significance of our own stone circles. He demurred altogether to the

argument that travellers to Britain from Egypt or elsewhere would have taught the prehistoric races to build stone circles on a solar system. These races were savages and could not have readily taken in a culture so much higher than their own. Lastly, in all these speculative theories we were going back perilously near to the ideas of Bryant and Davies, and he, the speaker, would join with Professor Rupert Jones in asking Mr. Lewis what relationship his conclusions had to those of the older and less informed antiquaries. In these criticisms he did not wish to underrate Mr. Lewis's services in the gathering of important facts.

Mr. Lewis, in reply, said the only evidence as to the use of a certain cubit was that the diameters of the five circles were even tens of such cubits—namely, 40, 50, 60, and 70, and the chances against such a thing occurring accidentally were enormous. One diameter was 66 cubits, so it would seem that the longest measure that could have been used for all of them would be a spear-shaft (to take Mr. Holmes' view) exactly 4 feet $2\frac{1}{2}$ inches long. Such a thing might have existed, and might have been used for the purpose, but it would be a very singular accident if it had. The idea of setting out the circles by measurement and using the same unit for all (whether it were a cubit, or a spear, or anything else) indicated a greater amount of intelligence than Mr. Gomme seemed willing to allow to the men who inhabited the huts by which the circles were surrounded, and by whom the circles were probably, though not certainly, erected. If these men had not the necessary knowledge it made it more likely that some more intelligent outsider had assisted them, perhaps without letting them know quite all that he was doing, or perhaps making a demonstration of his abilities with a view to creating a position for himself amongst the wild people in whose power he was placed. Mr. Lewis thought the construction of circles in this country might have begun two or three thousand years B.C., and have been continued up to, and here and there perhaps during and after, the Roman occupation, but, if these circles were contemporary with the surrounding huts (as he thought most likely), their date would be rather early. The object of the circles could only be judged from a study of the monuments themselves, and of the uses to which circles were put elsewhere; in other countries some circles were sepulchral, while others were known to be used for worship or sacrifice; in this country some small circles were clearly sepulchral, but others, especially the larger ones, were almost certainly not; those he had been describing belonged to the latter class, and, since they were so arranged as to be in particular lines with certain hills, he supposed that arrangement had a meaning—it might be observance or worship of sun, stars, or hills, any or all of them, and the triple summits suggested a phallic element. A difference of two or three hundred feet in the situation of the circles would have thrown the lines and distances quite out, and as the nature of the ground afforded no reason except what he had

suggested, but rather the contrary, why the circles should be placed just as they were, he thought his view most likely to be correct. If the approximate date and object of the circles could be fixed it would be a step to the identification of the builders, concerning whom there had been too much baseless speculation. The relation between the artificial hill of Silbury and the circles at Abury had been remarked for two hundred years, but he did not think the older antiquaries, or anyone before himself, had suggested any connection between the circles and the natural hills near them; but his suggestions as to this had been approved by some local archæologists of the present day, who were better acquainted than he himself was with the country and the monuments from which he had drawn his conclusions. He thanked the various speakers and the audience generally for the manner in which they had received his paper.

On the NORTHERN SETTLEMENTS *of the* WEST-SAXONS.

By JOHN BEDDOE, M.D., LL.D., F.R.S.

WE may gather from the statements of the Saxon Chronicle that a very large body, or rather large bodies, of Teutonic immigrants landed on the coast of Hampshire, and pushed northwards and north-westwards. South Hampshire and the south-eastern corner of Wiltshire would seem to have been among their earliest conquests; but even here Mr. Shore's papers, read to this Institute, are sufficient to show that the prior occupants of the country were not wholly extirpated nor ever wholly expelled, a sufficient number of them remaining, whether as wives or as vassals of the conquerors, to transmit some of their traditional notions or usages. Still, the preponderance of the intrusive blood is, in my opinion, witnessed by the prevailing forms and complexions of the modern inhabitants of this tract of country.

It is evident, however, that a long period elapsed before the conquerors pushed their western boundary far up the valleys of the tributaries of the Avon. Bokerley Dyke, which the discoveries of General Pitt-Rivers have shown to be of very late Roman if not rather of post-Roman date, may have constituted a part of that boundary for a considerable time. But the next advance of the Saxons was towards the north. It was no doubt far from uniform; very likely some of the less desirable parts of North Hants had been hardly touched when the fertile vale of the Kennet had been overrun and anglicised.

I am disposed to infer, from the meagre data which the Chronicle affords, that the successive stages of the conquest of the west of England were caused not so much by the ambition or combativeness of the kings who carried them out, as by the multiplication of the Saxon nobles and freemen, time after time, beyond the numbers which their lands would support, by the need in fact of lands and serfs for the super-abundant warriors of the rising generation. In the case of Ceawlin, who played in the south of England the part which Ethelfrith played in the north, there may have been a concurrence of an ambitious and able leader with a large accumulation of available military force. In 571 he seems to have crossed the Thames; and the decisive battle at Bedford placed all Oxfordshire and more than that under his sway. Ensham and Bensington were his; and it may have been already easy for his younger warriors to follow upwards the broad and open valleys of the northern tributaries of the Thames, to occupy the existing manors and settlements, or to carve out new ones from the woodland and desert whence population had decayed. The Welshmen, however, still held Cirencester, which was not subjugated until six years later, after the battle of Dyrham; so that the middle-Cotswold region, and the valley of the Churn in any case, were not yet open to settlement. The name Churn is ancient (*Corinium*, *Ciren*-cester), but I strongly suspect that those of the Windrush and the Evenlode, tributaries of the Thames which rise further to the north-east, and whose valleys open into Oxfordshire, are of Anglo-Saxon derivation. And where the Keltic name of a considerable natural feature in topography has not come down to us, we may always suspect that the Anglo-Saxon or Scandinavian settlers were numerous in proportion, or, what comes to nearly the same thing, that the district was vacant and desolate when the invaders arrived.

Bath was captured, and apparently destroyed or allowed to lapse into ruin and depopulation, at the same time with Cirencester. But Dr. Guest gives reasons for believing that Malmesbury, and probably Bradford, and a great part of the valley of the Avon between Malmesbury and Bath, remained in the hands of the Welsh until a good deal later. And though General Pitt-Rivers's discoveries have upset Dr. Guest's conclusions with regard to Dorset and South Wilts and the so-called Belgic ditches, his reasonings with regard to the country further north are still generally accepted. On the basis thus laid down, the population of East Gloucestershire ought, like that of Central Oxfordshire, to be largely Saxon; that of the country about Cirencester should be scarcely less so,

COLOUR OF HAIR AND EYES ON THE EASTERN SLOPE OF THE COTSWOLDS.

	Number.		Light eyes.						Neutral eyes.						Dark eyes.						Index.	
	Sex.		Hair.						Hair.						Hair.							
	Male.	Female.	Red.	Fair.	Brown.	Dark.	Black.	Total.	Red.	Fair.	Brown.	Dark.	Black.	Total.	Red.	Fair.	Brown.	Dark.	Black.	Total.	Gross.	Per cent.
Moreton-in-Marsh	75	33																				
Per cent. ..			4·6	20·2	27	6·9	..	58·7	..	2 7	5·5	4·6	..	12·8	1·8	·9	6·4	13	2 7	27·5	..	2·3
Cirencester, Fairford, Kempsford, Cricklade	32	28																				
Per cent. ..				18·3	32·5	2·5	..	53·3	1·6	2·5	7·5	3·3	..	15	1·6	..	5	24·2	·8	31·6	..	7·5
Bradford-on-Avon	125																					
Per cent. ..			3·6	14·8	24	8·8	..	51·2	·8	1·6	8	8·8	..	19·2	..	2	5·2	18·4	4	29 6	..	21·2
Bradford-on-Avon		125																				
Per cent. ..			4	14	28	6·8	..	52·8	..	1·6	10 4	3·2	..	15·2	1·6	1·6	7·2	19·6	2	32	..	10·8
Per cent. ..	both		3·8	14·4	26	7·8	..	52	·8	1·6	9·2	6	..	17·2	·8	1·8	6·2	19	3	30·8	..	16

while that of the upper valley of the Bristol Avon should contain a much larger pre-Saxon element. Let us see whether the physical characteristics agree with this view.

I have lately made a fair number of observations on the hair and eyes at the little town of Moreton-in-Marsh, or, as its people prefer to call it, Moreton-in-March; the occasion was a market day, and the subjects in great part farmers and peasants. And I have a smaller number from Cirencester, Fairford, and Cricklade; the number, 60, is too small for anything like certainty, but I believe the sample to be a pretty fair one. From Bradford-on-Avon I have 250; in this series the sexes are equal, and there is a large proportion of countryfolk; the number is large enough to be fairly trustworthy.

It will be observed on reference to the table annexed, that the northern part of the district under consideration, as represented by Moreton-in Marsh, has a very blond population, the distribution of colour bearing resemblance to that which I have found in other "Saxon" districts of England, and in parts of Flanders, Holland, Friesland, and Westphalia, with the same tendency to the conjunction of hazel or dark eyes with lightish hair, rather than of light eyes with dark hair. The headforms also, as far as I could judge from simple inspection, were mostly of the two types which Gildemeister found at Bremen, the graverow and the (so-called) Batavian, which are also those commonly found in Anglo-Saxon graves.[1]

The figures from Cirencester and its neighbourhood, so far as they go, point in the same direction, though the "Saxon" element may not be quite so strong. It is the women who here contribute most of the dark eyes and hair, and especially the dark eyes, which is the rule throughout England, and, I think, in most parts of Europe. In the figures from Bradford-on-Avon the admixture of the dark element, quite subordinate at Moreton, comes into prominence; there is still a general resemblance, but every dark-haired column is distinctly fuller. The proportions, however, are much more like those of other districts in Wiltshire than those of any part of Somerset, the combination of blue eyes with dark brown hair being still uncommon, and the "Wiltshire eye,"[2] which is a kind of muddy hazel, being very noticeable.

Bradford has been a weaving town for many centuries; its population has on the whole been a stationary one; and not much strange blood, apparently, has been introduced by settlement or intermarriage, except that Flemish or Walloon cloth

[1] "Races of Britain," pp. 46, 47 .203, 204, 207–209.
[2] *Ibid.*, pp. 177–8, 257.

workers at times settled here as refugees on account of religion. The native breed of Wiltshire generally is sturdy and stalwart; but in this place I am struck with the number of puny undersized men, generally dark-complexioned, who may perhaps be to some extent the results of continued unfavourable influences acting in the way of degeneration, or of misdirected social selection. Such influences have probably not acted to anything like the same extent in East Gloucestershire; in recent times, anyhow, that part of the country has been almost wholly pastoral or agricultural.

Still, it is difficult to avoid the conclusion that the differences in colour which I have mentioned are correlated with differences of race, and that they confirm the belief that the West Saxons settled numerously on the Upper Thames before they began to interfere with the inhabitants of the valley of the Bristol Avon.

MARCH 12TH, 1895.

E. W. BRABROOK, Esq., F.S.A., *President, in the Chair.*

The Minutes of the last Meeting were read and signed.

The presents which had been received were announced and thanks voted to the respective donors.

The deaths of Mr. HYDE CLARKE and Mr. C. H. E. CARMICHAEL were announced.

The following papers were read:—

"The Changes in the Proportions of the Human Body during the period of growth." By Dr. WINFIELD S. HALL.

"Notes on the Languages spoken in Madagascar." By J. T. LAST, Esq.

The Changes *in the* Proportions *of the* Human Body *during the* Period *of* Growth. By Winfield S. Hall, Ph.D., M.D.

[with plates iii, iv, v.]

In order to collect material which could serve an immediate purpose in school hygiene and which could be subsequently used in an anthropological investigation, I have made, under the most favourable circumstances, careful and extended observations upon about two thousand school boys and students of Philadelphia and suburbs. The study, from an anthropological standpoint, of the material so collected was made in Leipzig during the summer of 1894.

A. The Conditions of the Investigation.

The high tension of both physical and intellectual life in American schools and colleges, makes it expedient that such institutions employ the service of a physician whose examination of the pupils and students may afford an index of the physical capacity of the youths as well as to detect and prevent over-taxation of this capacity. These physical examinations are usually made twice annually. During four years (1889–93) the writer has been medical examiner at Haverford College, Philadelphia, and during two years of that period performed a similar service for three schools in or near Philadelphia, viz., the William Penn Charter School, the Haverford Grammar School, and the Wilmington Friends' School. All of these institutions are under the management of the evangelical denomination of Friends or "Quakers." A very large proportion of the youths are sons of *Friends*. Their parents were almost without exception born in America, and the families came originally from England. The families were with very few exceptions well-to-do. These youths presented still a further point in common; the exceptional opportunities which these institutions offered for physical development induced a great majority of the students and pupils to enter actively into athletics. They therefore presented a higher physical development than is usually found in city schools.

The material which came under the observation of the writer was, therefore, exceptionally homogeneous as to (1) race, (2) nationality, (3) social and financial condition, (4) physical development, (5) sex; and we can accept the results derived from this material as representing a true American type.

The circumstances under which the observations were made were exceptionally favourable, because the youths were wholly under the control of the examiner and his assistants during the examination. A special room was devoted to the purpose, and all of the measurements and observations were made upon the nude body.

B. THE OBSERVATIONS.

a. Anthropometric Observations.

These, though of less importance to the institutions than the anatomical and physiological observations, were used to determine the special exercise which individuals should take in the gymnasium (Turnhalle).

α. Instruments used.—(1) A vertical measuring staff divided into centimetres. This strong staff was held in its vertical position through being firmly fixed in a small portable platform. Upon this vertical staff was fitted a horizontal travelling arm. This instrument was used to take all vertical measurements, such as "*Height of Body*," "*Height of Knee*," &c. (2) A centimetre measuring tape made of waxed linen. Theoretically this material is inferior to the steel tape, but finding the latter exceedingly difficult to read readily and unpleasant to the subject, the waxed linen tapes were substituted and frequently compared with a steel tape. (3) Wooden calipers which were used to measure "Interacromial Breadth," "Intertrochanteric Breadth," length of upperarm, forearm and foot. (4) Steel calipers which were used to measure depth of chest and of abdomen. (5) Scales which gave the weight in pounds. This was reduced to kilogrammes. (6) A Mathew's Dynamometer, with which the strength of back, legs, chest, and forearms was determined. (7) A spirometer used to determine the capacity of the lungs.

β. The Procedure.—A card was devoted to the observations and history of each individual. On entering the examination room he wrote his name and such items of his personal and family history as he could himself answer upon the card; then presented himself nude to the examiner, who proceeded to take the measurements, hereafter enumerated, which were recorded by an assistant. A second assistant took and recorded the weight, capacity of lungs, and the strength tests. In this way an examiner and two assistants were able to examine about four persons per hour.

γ. Measurements.—

I. *Height of Body.*—The subject stands upon the measuring platform with his back to the vertical staff so that four points come in contact with

it: (1) the heels; (2) the sacrum; (3) the interscapular spinous processes of the dorsal vertebræ; (4) the occipital protuberance. The horizontal arm is pressed lightly upon the crown and the height read from the vertical staff.

II. *Height of Pubes.*—The subject turns his side to the vertical staff, the horizontal arm is brought to the upper edge of the symphysis pubis, and the height read from the vertical staff.

III. *Height of Knee.*—The subject steps off the platform with one foot while the tibia of the other extremity is left parallel to the staff; in this position the horizontal arm is brought to the upper surface of the horizontal femur vertically over the tibia, and the measurement read. This procedure is open to the objection that it is not the measurement of the tibia but rather of the lower segment of the leg plus the antero-posterior diameter of the femur. I admit this criticism, but say in defence of the measurement that its principal factor is the length of the tibia, that the error of measurement is very small, and that it is made with minimum expenditure of time. All of these considerations are very important when one must examine such a large number of individuals. It may be stated here that this measurement was taken both for the right side and for the left; which is true of all observations admitting of a right and left measurement. The median value of these right and left measurements has been found separately. The value given for height of knee in the Anthropometric Table I is the average of these two means; this is true of girth of thigh, girth of upperarm, &c., &c.

IV. *Girth of Head.*—One measures the largest circumference, or the one passing through the occipital protuberance and immediately above the superciliary ridges. The tape must be applied symmetrically and must be drawn quite tightly in order to eliminate, as far as possible, the error due to the presence of hair.

V. *Girth of Neck.*—One measures over the larynx and transverse to the axis of the neck. In all measurements of soft parts of the body, the observer is in constant danger of a large error of observation through the varying amount of tension which he inadvertently applies to the tape. In the measurement of the neck one may easily make a difference of 1 centimetre through a very moderate change in tension, while a difference of even 2 centimetres may be made in such large circumferences as those of chest and abdomen. This source of error may be reduced to at least one-half of the above-mentioned limits, if one takes care to bring the tape to a uniform tension before reading any measurement. Some anthropometrists use a little spring index on one end of the tape which indicates the degree of tension.

VI. *Girth of Chest* is to be measured in a horizontal plane which includes the nipples. A further source of error to which this measurement and the two following are subject is the varying amount of air in the lungs. After trying several plans the writer chose the following as having essential advantages; the measurement is taken after forcible expiration and after forcible inspiration. The average of these is assumed as the girth of the chest in repose and is the value recorded in the table.

VII. *The Girth of the Chest at the ninth Rib* is found by passing the tape in a horizontal plain and through the juncture of the ninth rib with its cartilage.

VIII. *The Girth of Abdomen* is measured in a horizontal plane, which passes through the umbilicus. The measurement is taken while the abdomen is as little as possible affected by the quiet breathing.

IX. *The Girth of Hips* is measured in a horizontal plane which is determined by the point midway between the trochanter and the crest of the ilium.

X. *The Girth of Thigh* (as well as measurements XI, XII and XIII) is taken after the subject has separated the feet to a distance equal to about the length of one of the feet. The subject must stand with the parts of the body symmetrically disposed, and must not put muscular stress upon any of the muscles involved in the measurement. The observer must be keen to avoid the errors which creep in through the spirit of emulation among the youths. To have an arm or thigh whose girth is 1 centimetre greater than that of one's rival is an envied distinction among schoolboys.

XI. *The Girth of Knee* is measured over the middle of the patella.

XII. *The Girth of the Calf* (*crus*) is measured at its greatest diameter.

XIII. *The Girth of Ankle* is measured at the smallest diameter, just above the malleoli.

XIV. *The Girth of Upperarm.*—The subject extends the arm horizontally sidewards and flexes the forearm until it stands at right angles to the upper arm ; with the arm in this position, one measures the girth at its greatest point.

XV. *The Girth of Elbow.*—While the arm is extended, one measures the girth over the upper extremity of the olecranon process.

XVI. *The Girth of the Forearm* is taken at the largest diameter.

XVII. *The Girth of Wrist* is taken just distal to the stiloid process of the ulna.

Measurements X to XVIII were taken and recorded as right and left. The median value of these was found and the average of this median is recorded in the Anthropometric Table (I).

XVIII. *The Depth of Chest* is found by the use of the steel calipers, one point of which is placed upon the sternum in the middle of the line joining the two nipples, and the other point upon the dorsal spinal process which lies in a horizontal line from the point taken on the sternum. In this position the calipers are clamped and removed. The distance between the two points of the calipers may be measured upon the vertical staff or upon the long arm of the wooden calipers. This observation is made after forced expiration and inspiration, and the average taken. In these measurements of the chest which involve forced expiration and inspiration the difference of the two measurements is a valuable index of the mobility of the chest skeleton.

XIX. *The Depth of Abdomen* is found with the same instrument. One point of the calipers is placed on the anterior surface of the abdomen about 1 cm. above the umbilicus, while the other is placed on a vertical spinous process directly dorsal to the first point.

XX. *The Interacromial Breadth* is naturally the distance between the external extremities of the two acromions, and is measured with the wooden calipers (as are also measurements XXI, XXII, XXIII, XXIV).

XXI. *The Intertrochanteric Breadth* is the distance between the outer surfaces of the greater trochanters.

XXII. *The length of the Upperarm.*—The subject places the upperarm vertical, with the forearm at right angles to it. One measures the distance between the upper surface of the acromion process and the lower surface of the olecranon.

This procedure and that in XXIII, are subject to the same criticism which we have already discussed under III (*Height of Knee*), and have the same points in their favour ; *the variable factor* in each case is the long bone whose length makes most of the segment measured. The measurement is subject to a small error of observation, and may be made easily and quickly.

XXIII. *The Length of Forearm and hand.*—The subject retains the position of the previous observation except that the fingers are extended.

The measurement is taken from the superior end of the olecranon to the tip of the third digit.

XXIV. *The Length of Foot* is measured from the posterior surface of the calcaneum to the tip of the first or second digit.

XXV. *The Weight of nude subject* is recorded in kilogrammes.

XXVI. *The Capacity of Lungs* is readily measured by means of the spirometer. The subject fills the lungs as full of air as possible and slowly expels it through a tube into the instrument. The volume of air is read from an automatic register.

XXVII. *The strength of Back.*—This observation, as well as XXVIII, XXIX, XXX, is made with the help of the dynamometer. The strength of the back and the legs being too great to be registered directly by the dynamometer, recourse is had to a lever which is placed under the floor of the above mentioned platform and whose long arm, five times the length of the short arm, rests against the dynamometer. The subject communicates his strength to the short arm of the lever by means of a chain and a handle. He stands upon the platform, extends his legs, and flexes his back, and, grasping the handle, which has been adjusted to a convenient height, he exerts the force of the extensor muscles of the back. The dynamometer registers approximately $\frac{1}{5}$ of the power exerted.

XXVIII. *The strength of the Extensor muscles of the Thigh.*—The subject standing as in XXVII, but with extended back and flexed legs grasps the handle and extends the legs. The dynamometer registers $\frac{1}{5}$ of the power exerted. In these two strength tests the strength of grip of the hands or the strength of the flexores digitorum muscles forms a limit to the test, for it frequently happens that the subject is not able to exert the full strength of back or legs owing to his inability to retain his grasp of the handle. To be sure a fertile mind could easily contrive a harness for the shoulders which would supplement the grip-power, but in testing the strength of young, growing individuals, it is wise to leave this hygienic limit undisturbed, for in competing with each other they might otherwise easily injure themselves.

XXIX. *The Strength of the Pectoral Muscles.*—The dynamometer is held in a case which affords two convenient handles about 15 cm. apart, and so arranged that power exerted to bring the handles nearer together is applied directly to the dynamometer. The dynamometer-case is held against the anterior surface of the thorax in such a way that the two forearms lie in one horizontal line and the subject exerts the strength of the muscles in question against the handles.

XXX. *The Strength of the Fore arm*, or of the flexor muscles of the fingers, is found directly with the dynamometer.

XXXI. *The Strength of the Upper arm—of both extensor and flexor muscles.*—In both cases the strength is measured by the number of times these muscles are able to raise the body from the floor. In the first case the subject stands between "parallel bars," with hands upon the bars, the forearm flexed sharply upon the upperarm, and lifts his weight from the floor through contraction of the triceps until the arm is fully extended. In the second case he grasps the "horizontal bar" and lifts his body until the chin is above the bar. Let us suppose that the subject weighs 50 k. and lifts his body ten times by extension and twelve times by flexion of the arm, he lifts 50 k. 22 times or 1,100 k. In order not to give this test an undue preponderance among the other strength tests one takes arbitrarily 10% or 110 k. as the strength of upperarm. This result is more valuable than the process is scientific.

b. Anatomical and Physiological Observations.

None of the observations in this group have been used in the present investigation. Their purpose, as is apparent from the character of the observations, was to find and record the exact physical condition of the pupil. A knowledge of this condition enables the examining physician to protect the student or pupil against overwork, or to warn him of conditions which need further medical attention. The most important of all these is, of course, the condition of the eyes, for certain errors of refraction express themselves in headaches and other disturbances not usually attributed to errors of refraction by the non-professional. An early correction of an error of refraction is of the greatest importance to the pupil, both from the standpoint of his health and of success in his studies.

I. Nutrition.
II. Pilosity (1) Amount, (2) Colour.
III. Muscular condition and development.
IV. Condition of Circulatory system—determined by means of a sphygmograph, and a stethoscope.
V. Condition of Lungs—determined by inspection, palpation, percussion and auscultation.
VI. Condition of the Eyes—determined through the use of ophthalmological instruments of diagnosis. (1) Vision. (2) Error of Refraction ? (3) Disease ?
VII. Condition of the Ear—determined (1) by means of an otoscope, which, however, was used only when the (2nd) test—sharpness of hearing—indicated it. (2) The sharpness of hearing was determined by means of a Galton whistle.
VIII. Acuteness of feeling—determined by means of the application of two points (usually those of a compass or of a pair of dividers), to the volar surface of a finger.

c. Historical Data.

The subject or one of the assistants records the Name, Age, Race, Nationality, Father's Business, number of brothers and sisters. If any members of the immediate family have died, the cause of the death is recorded if known ; past diseases are noted.

C. THE APPLICATION OF THE ANTHROPOMETRIC DATA.

a. The Methods.

After one has completed his observations, his work has really only begun. The work which remains to be done may be considered under two general heads :—

(1) The computation of the averages or medians ; and
(2) The use of these values in deducing general conclusions and arriving at the laws of growth, of bodily proportion, and of changes of proportion.

1. The ease with which the computation of averages may be accomplished, depends upon the method of recording the observations. If they are recorded in tables in the order observed, the grouping of the observations according to age, &c., &c., can only be done at great expense of time. The method of recording the measurements of an individual upon a card was emphasised by *Galton*,[1] and is generally used in America. It has the great advantage of allowing as many and as intricate groupings and re-groupings as the investigator may desire, at the slight expense of time and attention required to rearrange the cards. As the individuals which the writer observed were homogeneous as to race, nationality, sex, social condition and physical development, it remained only to group them (1) as to age, which grouping was retained throughout the whole investigation, (2) as to the value of the different measurements. To illustrate the last grouping let us take for example the age, *nine years*; and the measurement, *Girth of Wrist*. Suppose that of 64 nine-year-old boys measured, 1 had a wrist-girth of 10·5 cm., 6 at 11 cm., 15 at 11·5 cm., 20 at 12 cm., 14 at 12·5 cm., 4 at 13 cm., 1 at 13·5 cm., 1 at 14 cm., 1 at 14·5 cm., and 1 at 15 cm. The groups contain from left to right 1, 6, 15, 20, 14, 4, 1, 1, 1, 1, cards respectively ranging from the lowest observed measurement to the highest, and representing equal intervals. The result of this grouping is to be recorded in a table. [See Table A, rubrics 1 and 2.]

TABLE A.

THE GIRTH OF WRIST AT 9 YEARS.

1 Girth.	2 Observations.	3 a.
cm.		cm.
10·5	1	10·5
11·0	6	66·0
11·5	15	172·5
12·0	20	240·0
12·5	14	175·0
13·0	4	52·0
13·5	1	13·5
14·0	1	14·0
14·5	1	14·5
15·0	1	15·0
	$64 = n$	$773·0 = \Sigma a$

[1] The numbers refer to the literature catalogue at the end of the Paper.

Whether one proceeds, as just described, with cards, or whether by the much more laborious method of grouping from a table, he comes eventually to this point common to both methods, *i.e.*, the recording of the number of observations for each different value as shown in rubrics 1 and 2 of the table. From this point the ways diverge again, the one toward the computation of the *average* and the other toward the computation of the *median value*. If he wishes the former he uses the formula given by *Stieda*,[2] *Schmidt*,[3] *Lexis*,[4]

$$A = \frac{\Sigma a}{n}.$$

In this formula a is the product of any value in rubric 1 and the number of observations of that value. [See rubric 3.] Σa is the sum of these products, and n is the number of observations. According to this formula the average girth of wrist of the 64 boys measured is ($773 \div 64 =$) 12·08. If one wishes the median value of the values in question, he determines it from an inspection of the grouping, or if the number of observations is very large he may use a simple arithmetical process. If one glances at rubric 2 of the table, he notices at once a "*principal group*," 20, on either side of which are groups decreasing in size in both directions from the principal group. Inasmuch as the groups 15, 6, 1, represent values less than that of the principal group, and groups 14, 4, 1, 1, 1, 1, represent values greater, we may call the former the "minus groups" and the latter the "plus groups." Inspection shows that there are as many observations above the principal group as below it. The median value (M) therefore equals 12 cm. As this is an unusually simple case let us assume three typical cases. [See Table B.] Case I shows group 20 to be the "principal group."[1]

TABLE B.

THREE TYPICAL CASES OF GROUPING.

Girth of Wrist.	10·0	10·5	11·0	11·5	12·0	12·5	13·0	13·5	14·0
Case I ..	1	1	5	14	20	15	6	2	0
Case II ..	1	4	6	14	15	12	8	3	1
Case III ..	1	2	5	24	22	8	1	1	0

[1] It is sometimes difficult to determine the "principal group." *Porter*[5] defines it as "the group which added to the sum of those at its right (or left) exceeds half the number of observations," *i.e.*, $1 + 1 + 5 + 14 = 21$, and $21 + 20 > 32$. Therefore the 32nd man is *in* group 20, so group 20 is the "principal

Before we proceed to find the median value for each of these cases it is important to know whether the observer read and recorded the *centimetres and tenths* of cm. or the *nearest half centimetre*. The significance of the principal group will be quite different in the two methods, and the median value will be obtained in a different way. As my observations were recorded in centimetres and the nearest fourths above, expressed decimally, it is clear that the twenty observations of the principal group are distributed over the space between the values 12 cm. and 12·5 cm. We assume that they are evenly distributed. Let M = median value, a = value of "principal group," d = distribution of the groups, or the difference of the minimum values of two consecutive groups, which in this case equals 0·5 cm., G = number of observations in the principal group, Σm = total number of observations in the "minus groups," Σp = total number of observations in the "plus groups." The process of computing M can be expressed more clearly by the following mathematical formula, than by a word formula:—

$$(1) \quad \ldots\ldots \quad M = a + \left[\frac{\Sigma m + \frac{G}{2}}{n} \times d\right]$$

$$(1') \quad \ldots\ldots \quad M = (a + d) - \left[\frac{\Sigma p + \frac{G}{2}}{n} \times d\right]$$

The truth of these formulæ is so evident that they need no further explanation. Let me apply them both to Case I.

$$(1) \quad M = 12 + \left[\frac{21 + \frac{20}{2}}{64} \times \cdot 5\right] = 12 + \left(\frac{31}{64} \times \cdot 5\right) = 12 \cdot 242$$

$$(1') \quad M = 12 + \cdot 05 - \left[\frac{23 + \frac{20}{2}}{64} \times \cdot 5\right] = 12 \cdot 5 - \left(\frac{33}{64} \times \cdot 5\right) = 12 \cdot 5 - 0 \cdot 258$$

$$- = 12 \cdot 242$$

Case II.

$$(1) \quad M = 12 + \left[\frac{25 + \frac{15}{2}}{64} \times \cdot 5\right] = 12 + \left(\frac{32 \cdot 5}{64} \times \cdot 5\right) = 12 \cdot 254 -$$

$$(1') \quad M = 12 + \cdot 5 - \left[\frac{24 + \frac{15}{2}}{64} \times \cdot 5\right] = 12 \cdot 5 - \left(\frac{31 \cdot 5}{64} \times \cdot 5\right) = 12 \cdot 5 - (\cdot 246 +$$

$$= 12 \cdot 254 -$$

group." When the groups are very large, as was the case in Porter's observations of over 30,000 St. Louis school children, several central groups may be nearly equal in size, and the "principal group" *may* even be smaller than one of the minus or plus groups.

Case III is a somewhat unusual one: $\Sigma m = \Sigma p$, and there is no "principal group." The formula may be applied readily, however, if we use $a = 11{\cdot}5$.

$$(1)\quad M = 11{\cdot}5 + \left[\frac{32 + \frac{0}{2}}{64} \times {\cdot}5\right] = 11{\cdot}5 + 0{\cdot}25 = 11.75$$

$$(1')\quad M = 11{\cdot}5 + {\cdot}5 - \left[\frac{32 + \frac{0}{2}}{64} \times 0{\cdot}5\right] = 12 - 0{\cdot}25 = 11{\cdot}75^{1}$$

Our conception of median values does not admit of the expression being applied for example to the average size of the grains of sand on the seashore, but only in cases where we deal with a type-form. One may correctly seek the median weight of the grains of wheat of a particular variety, grown under similar circumstances. In other words one may find the median value of a type whose variations are due to accidental causes. Of the general application of this principle, *Quetelet*[6] said, "Cette loi des causes accidentelles n'est point particulière à l'homme, elle s'observe sur tout les êtres vivants de la création, sur tous les groupes que l'on est convenu de désigner par le nom d'espèces." *Galton*[1] followed Quetelet's lead and always used the median. That it is not generally used may be shown from *Stieda's*[2] statement: "In den anthropologischen Handbüchern von Broca, Topinard u. Roberts befindet sich keine andere Angabe als die Metode der arithmetrische Mittelzahl, so auch anthropologische Statistiken in allgemein."[2] When the number of observations is large

[1] The method given above was the method applied in the writer's computations. It may be worthy of note that when the measurements have been recorded in *nearest half centimetres*, the formula must be changed. Take for example Case I. The 20 observations in the principal group are not distributed between 12·0 and 12·5 cm., but between 12 − 0·25 and 12 + 0·25. In other words the chances are that there will be as many below 12 cm. as above it in value. With this conception of the principal group, it is clear that *M may* be *less* than *a;* in the above described procedure it is *always more* than *a*. The following formula may be used:—

$$(2)\quad M = \left(a - \frac{d}{2}\right) + \left[\frac{\Sigma p + \frac{G}{2}}{n} \times d\right]$$

$$(2')\quad M = \left(a + \frac{d}{2}\right) - \left[\frac{\Sigma m + \frac{G}{2}}{n} \times d\right]$$

For Case I, $M = 11{\cdot}75 + 0{\cdot}258 = 12{\cdot}008$.
For Case II, $M = 11{\cdot}75 + 0{\cdot}246 = 11{\cdot}996$.
For Case III.—As there is no principal group we must take a equal 11·75, *i.e.*, midway between the highest minus value and the lowest plus value, then—

$$M = 11{\cdot}75 + 0{\cdot}25 - 0{\cdot}25 = 11{\cdot}75.$$

[2] In the Anthropological Handbooks of Broca, Topinard and Roberts, he finds only the arithmetical average, the same is true for anthropological statistics in general.

there is no essential difference between the average and the median value. There is, however, an essential difference in the time required to obtain them, and this difference is in favour of the median value. If the number of observations is small, there is no essential difference in the time required to obtain these two results, but there is an essential difference in the value of the results, and that difference is in favour of the median value. These are the considerations which actuated the writer in the choice of the median value rather than the average. Having found the median value of each measurement for each age, these values were tabulated.

(2) Having collected and prepared the raw material for the solution of the question in hand, there remains yet the comparison of the median or type values and the deduction of laws. In order to facilitate the comparison of the median values with each other, the ratio of each one to the height for that age has been computed and appears in the rubrics headed "ratio" in the Anthropometric Table I. For many centuries artists took the length of the head as a basis of ratios or "modulus." For the use of the artist who deals with ideal figures, this has much to recommend it. If one glances at the anthropometric table he will find that scarcely another measurement undergoes so great a change of ratio, compared with all other parts of the body, as does the head. For anthropological purposes it is quite unfit to be used as a modulus. *Carus*[7] and others used the vertebral column. The difficulty of its exact measurement, with the fact that it has been so seldom measured by recent anthropologists, makes this theoretically perfect modulus practically useless. In this investigation the writer has used the theoretically somewhat objectionable modulus—*Height of Body*—for the following reasons. (1) It may be easily and exactly measured. (2) It is the most common measurement made, and therefore admits of use in a great mass of recent anthropometric data. (3) It has already been used as a modulus to a limited extent. (4) Being the largest measurement, all ratios are less than unity. (5) Its variation is in a general way parallel to that of the other measurements.

The next step was the grouping of the length measurements and of the joint, trunk and muscle girths, and the reduction of the totals to percentages of the median values for nine years. (Table II.) The investigation of the relation of weight to volume and of the relation of lung capacity to strength and to volume, occasioned the construction of Table III.

b. The Results.

a. *General Changes of Proportion.*—1. Of primary importance is the consideration of the relation between *lengths* and *girths.*

An inspection of the " reduced " heights and lengths (Table II) shows these to be practically parallel. The reason for this is clear; two of the length measurements are the most important factors in the changes of height; two others, length of the arm segments, naturally follow a law of growth similar to that of the legs (see 7, p. 35); while the foot must make its growth *pari passu* with the increasing height in order to form an adequate base of support. The modulus—Height of Body—must therefore be used to represent the growth in lengths. The girth measurements have been divided into three classes—joint-girths, trunk-girths, and muscle-girths. (Table II.)

The totals of each of these classes have been reduced to a percentage series with that of nine years as a base. The average of these three classes may represent the total girths of the body.

If the percentage series of heights be represented by a curve, it will be found that from 10 to 12 the increase is *less* rapid than during the preceding period; from 12 to 13 *more* rapid; from 13 to 14 *less* rapid; from 14 to 15 *more*; after 15 each annual increase is less than that of the preceding year. If the percentage series of total girths be represented by a curve, the rate of growth of the 9th year will be seen to continue through the 10th, thus surpassing the height. (See Plate I.) From the 11th to the 13th year the increase is *less* rapid and is surpassed by the height; from 13 to 14 *more* rapid and surpasses the height; from 14 to 15 the girths are again surpassed by the height, but during the 16th year the girths gain a permanent and ever increasing ascendancy. That these curves cross each other four times between the 10th and 16th year is an exceedingly interesting fact. If subsequent investigations show this crossing of girth and length curves to be a constant phenomenon, it may be considered as one of the most important laws of growth. A reasonable interpretation seems to be; that the body widens out, then takes an upward shoot, then widens out preparatory to another upward growth. In other words it seems that the body cannot grow rapidly in both directions at the same time. To make such a phenomenon possible, it is necessary that the curve of heights should show at least one period of rapid increase. The curve of heights shows two such periods, viz., 12 to 13 and 14 to 15. *Bowditch*[8–10] found two waves of height-growth, 10 to 11 and 13 to 15. *Pagliani*[11] found one pronounced wave extending from the 13th to the

17th year. *Key*[12–13] found two—12 to 13 and 15 to 16, while *Kotelman*,[14] who measured Hamburg children, found two—12 to 13 and 14 to 15.

2. The growth in height is due largely to increase in length of long bones. If we can compare the girth of bones with their length we shall find the same thing is true of bone growth as of general body growth. Unfortunately, no bone-girths were taken. The nearest approach to such are the joint-girths which though including tendons, ligaments, and even in some cases adipose tissue, nevertheless include nearly as large a proportion of bone tissue as does the height; and, fortunately, the parts of bones included in joint-girths are the parts which one would expect to take part in this alternate wave growth if any part of the bone does. Admitting all the imperfections of the procedure, we will trace the curve. (See Plate II.) The increase from 9 to 12 is unchanged, but when the bones begin to increase rapidly in their vertical dimension, from 12 to 13, we find the increase of the lateral dimension essentially retarded; and when the vertical dimension undergoes its second retardation, between 13 and 14, the joint-girths make an increase which more than makes up for their previous retardation. An inspection of the curves for joint-girths and muscle-girths makes it clear that this demonstrated crossing of the curves representing bone-girths and lengths is *not* influenced by the development of muscles (which cause the increase of tendons and fascia), because the retardation and acceleration of joint increase is in every case more marked and more prompt than that of muscle increase. In fact there is no essential change in muscular development until after the skeleton has nearly reached its growth. At 16 the muscular system begins a rapid development which begins in the 17th year to affect the joint-girths, and continues to affect them during the whole subsequent period of growth, causing a divergence between the curves of joint-girths and height.

This latter effect of the muscular development is probably partly due to increase of tendon and fascia, but also largely due to actual growth of bone prominences as well as general increase in volume of the epiphyses due to muscle stresses and strains. It seems then to be established from the data used, that a rapid increase of bone in one dimension is accompanied by a less rapid increase in the dimension transverse to it.

3. The trunk-girths are affected (1) by skeletal development; (2) by muscular development; and (3) by the development of organs of digestion and respiration. Of course among older individuals the accumulation of adipose tissue is a strong factor, but among athletic boys the accumulation of fat is so rare that it invariably fails to affect the *median value*.

Which of the three factors just enumerated is the strongest? If the first, then we shall expect the curve to be decidedly undulating between 9 and 15 years; if the second, we shall expect the curve to be parallel with that of muscle-girths especially after the 15th year.

Plate III shows that skeletal development must be a secondary factor. These four trunk measurements include considerable muscular tissue, especially girth of chest (vi) and girth of hips. That the curve is only secondarily affected by these is shown by the noticeable divergence after the 16th year, the time when the hip and chest muscles really begin their greatest development. What causes the very noteworthy upshoot in the curve of trunk-girths during the 15th and 16th years? The class of boys observed in this investigation were taking their last years of school in preparation for college and university life. A very large proportion of them were engaged in the athletic contests between rival schools. During a large part of the time they were under severe "training." The lung capacity was very important. The power of the system to digest and assimilate a large quantity of food was important. I believe that this rapid development of trunk is the index of a development of the organs of respiration and digestion which follows in immediate response to the requirements of the rapidly developing and severely taxed muscular system. It is, therefore, *indirectly* caused by muscular development, and *directly* caused by increased metabolism.

4. The resultant of total girth and height.

If, now, it is true that an acceleration of height increase is compensated by a retardation of girth increase, we should expect the resultant of these two series to represent the general growth. Such a line traced on Plate I, midway between the curves for height and total girths, will show slight retardation of the increase. There is then *slight* retardation of *general* growth. *Bowditch*,[9] *Key*,[13] *Porter*,[5] *et al.*, taking usually only height into consideration, naturally find a very essential retardation somewhere between the 9th and 14th years. This is usually attributed to the influence of approaching puberty. That theory is quite probable because it seems to have a constant time relation to puberty, but I believe that the retardation when *general growth* is taken into consideration, is less than is usually supposed.

5. *The Height of Pubes* is usually about one half the body height. Table I shows this measurement to be exactly half the height at 9 years and at 23 years 51 per cent.; *i.e.*, the middle of the body has moved downwards to about the middle of the symphysis. This coincides perfectly with the results that others have gotten.

6. *The Height of Knee* and the *Length of Thigh.*[1] The former measurement undergoes a relative retardation during the three years when the *modulus* is rapidly increasing; but at 23 it has the same relation to the *modulus* as at 9. The length of thigh, however, is a strong factor in the increase of the *modulus* during the 12th, 13th and 14th years. If we compare the thigh with the leg (crus) we find that the latter seems to have reached its limit of growth by the end of the 16th year, while the former continues to grow for at least 3 years.

7. *The Length of Forearm* and of *Upperarm.* As these two measurements are homologous with the two discussed above (6) we may expect the same general facts to be true of these as of the leg and thigh; and such is the case. The ratios of the arm segments to the body undergo a metamorphosis similar to that noticeable in the leg segments, and, what is still more noteworthy, the relation of the forearm to the upperarm is the same as the relation of the leg to the thigh. There being nothing in the *present* use of these anterior and posterior limbs to cause a parallel course of development, we must seek the cause in the distant *past.*

8. The proportional girth of chest decreases during the years of rapid increase of the modulus, but after the 13th year undergoes a noticeable increase through the whole period observed even after bone and muscle development have practically ceased. This may be accounted for in part by the increasing bodily activity requiring more active respiration which in turn develops the chest.

9. The proportional girth of abdomen is variable, reaching a minimum at 15, increasing very much from 15 to 21 (where it regains the original ratio), and showing a larger increment during the 23rd year than any other measurement. These changes of proportion may be due to athletic activity during the period from 13 to 18 and to the increasing adipose tissue later.[2]

In 1889 *Bertillon*[15] said regarding *changes of proportion* ("Les Proportions du Corps humain," "Revue Scientifique," T. 17, p. 524), "Quand dans un même groupe ethnique, on compare entre elles les mensuration des diverses parties du corps, on observe qu'à mesure que l'une d'entre elles s'accroit, les valeurs *moyennes* de tout les autres croissent en valeurs absolues, mais décroissent en valeurs relatives par rapport à la première pris comme mètre."

[1] The length of thigh does not appear in Table I, but it may be read from the table by taking the difference of height of pubes and height of knee.

[2] Several other measurements admit of interesting discussions, but as they are of less interest than the topics to follow, they will be omitted.

Though this was sharply criticised the next year by *Manouvrier*,[16] it was subsequently defended by *Hansen*,[17] who said of Bertillon's Law of Proportion:—"Es ist ein Wachstumsgesetz vom grössten Interesse, dessen Erklärung im mathematisch-statistischeses Problem darbietet, das nicht eher gelöst werden kann, bis auch das Verhältniss aller Körperteile genau untersucht ist."

The writer believes that he has made a number of observations sufficiently large, and a study of the proportions and their variations, sufficiently extended to justify the opinion that if in the application of this law one uses as the unit for comparison the *part* of the body *which is growing most rapidly*, the law is absolutely true—it is even axiomatic; if, however, one takes as a unit any part which is growing relatively slowly the law is untrue. It is an open question whether or not Bertillon intended to exclude the second application of the law; his statement certainly does not seem to exclude it. The writer ventures to formulate the following Law of Proportion:—

A Law of Proportion of the Human Body. When the vertical dimension of the human body is undergoing an acceleration of its rate of growth the horizontal dimensions undergo a retardation of their rate of growth; and conversely.

β. The Relation of Weight to Height and to Volume.

As early as 1838 *Quetelet*[18] said ("Ueber den Menschen"), "In Allgemein weicht man wenig von der Wahrheit ab wenn man annimmt dasz das Quadrat des Gewichts der verschiedenen Lebensalter während der Entwickelung sich wie die fünften Potenzen des Wuchses verhalten"; . . . aber "bei vollkommen ausgewachsenen Personen von verschiedenen Grössen sich ungefähr wie das Quadrat des Wuchses zu einander verhalten."

Letting W = weight and H = height we have

(*a*) . . . . $W^2 : w^2 :: H^5 : h^5$ or $W : w :: H^{2\frac{1}{2}} : h^{2\frac{1}{2}}$

(*b*) . . . . $W : w :: H^2 : h^2$:

Sometime later *Hutchinson*[19] suggested the formula:

(*c*) . . . . $W : w :: H^{2\frac{1}{2}} : h^{2\frac{1}{2}}$ or $W^4 : w^4 :: H^{11} : h^{11}$.

In 1869 *Gould*[20] applied Quetelet's formula (b) with not very satisfactory results because of not applying it in just the way Quetelet intended it should be applied. In his "Anthropometric," 1871, Quetelet applies not only his old formula (b) but a new formula (c) $W : w :: H^3 : h^3$, to the weights and heights from birth to 30 years of age. Plate IV shows this comparison graphically illustrated. It is evident that formula (c)

will be no improvement on those suggested before. Now, inasmuch as similar bodies of similar material vary in mass as the cubes of homologous dimensions, Quetelet's formula (c) should solve the relation of weight to height. *Gould*[20] gets at the truth of the situation when he says in this connection: "If the *average proportions remained unchanged in men of different statures*, we might expect their weights to vary as the *cubes* of their *heights*." Two distinct problems have been presented by the anthropologists (1) *What is the relation between weight and height?* The attempts to solve it are given in the formulæ above quoted. Any one of the above formulæ may be made a most valuable basis for comparisons in statistical and hygienic problems of anthropometry. *Schmidt (E.)*[21] uses formula (b) in the comparison of city and country boys and girls (Plate V). The greater divergence of the curves for city boys demonstrates a greater disparity between weight and height. *Geissler*[22] applies formulæ (a) for similar purposes and with similarly satisfactory results (Plate VI).

(2) *What is the relation of weight to volume?* As far as has come under the writer's notice this problem has not been solved. By immersing the body in water, the volume of the displaced water would equal the volume of the body. Having determined the weight and volume one may compare directly, and will find slight variations due to difference of specific gravity, which varies within narrow limits conditioned by relative amounts of fat and of bone and muscle.[1] This process was applied by the writer in the laboratory of Professor Sargent, Harvard University; it is, however, quite impracticable for general use. An approximate index of the body-volume must be sought in the measurements. *Quetelet's*[6] trial proved that the cube of the height is not an index. Let the following combination be tried by way of experiment:—

(*a*)	Interacromial Breadth cubed	(See Table III, rubric 3)
(*b*)	Height × Depth of Chest × Breadth of Hips	(„ „ „ 4)
(*c*)	Height × Interacromial Breadth × Depth of Abdomen, H × I × A	(„ „ „ 5)
(*d*)	Height × Depth of Chest *squared*; $H \times \overline{DC}^2$	(„ „ „ 6)

That suggestions (a) and (b) do not fill the requirements is easily seen in the wide divergence of the percentage series of rubrics 3 and 4 from that of the weights (rubric 1). An inspection of rubrics 5 and 6 shows a remarkable coincidence of both with rubric 1. It will be noticed that after the 18th year the series obtained through trial (c) diverges essentially. I do not believe that it would continue to diverge. This brief

[1] Note must be taken of the degree of inflation of the lungs.

trial seems to indicate that one or the other of the following formulæ furnishes an approximate solution to the question:

The relation of weight to volume—

(α) . . . . . $W : w :: H \times I \times A : h \times i \times a$ (suggestion *c*.)

(β) . . . . . $W : w :: H \times \overline{DC}^2 : h \times dc^2$ (suggestion *d*.)

Preference is given to formulæ (α) on theoretical grounds, because the volume is based on the product of three dimensions, while (β) is based on the product of one and the square of a second. Plate VII gives the curves of the series in rubrics 1, 5 and 6.

γ. The relation of lung capacity to weight, to volume and to strength.

That the development of the lungs must have a definite relation to metabolism is the first thought that presents itself. If we could measure metabolism, the problem might be easily solved. That the amount and intensity of metabolism is not dependent on weight is clear, because some of the most important factors in the weight—adipose and skeletal tissues—are only slight factors in metabolism. That it is further not dependent on volume is also clear, because even muscular and glandular tissue may participate in very sluggish or very active metabolism. May it not be true that general bodily strength will furnish us with a reliable index of lung capacity? The following considerations seem to indicate such a relation: (1) The strength varies with the development of the muscular system. (2) The metabolism varies with the development and activity of the muscular system, directly through muscle respiration and indirectly through glandular activity. (3) The respiratory activity varies with the amount of metabolism. (4) The lung capacity varies with the respiratory activity. *Therefore* THE LUNG CAPACITY VARIES WITH THE STRENGTH. (Expressed mathematically

$$Lc \propto S \text{ or } Lc : lc :: S : s.)$$

To see that lung capacity has no relation to weight, see Table III, rubrics 1 and 7. To see that it has not a marked relation to general bodily volume is clear after a comparison of rubric 7 with rubrics 4, 5 and 6. The strength tests involved all of the principal groups of muscles. The result of the tests are given in Table IV. The total strength (reduced) is given in rubric 9, Table III, while the lung capacity is reduced to a percentage series having the value for 14 years as base. An extension of the observations beyond the 23rd year would have no especial value because both lung capacity and strength reach a maximum about that time. A comparison of these two variables at

ages below 14 years should be made before the value of the above suggested formula can be sufficiently tested. With the data at hand as a basis I believe I am justified in the conclusion that—

The lung capacity varies with the strength.

D. The Results Formulated.

1. *A law of Proportion of the Human Body.*—When the vertical dimension of the human body is undergoing an acceleration of its rate of growth, the horizontal dimensions undergo a retardation of their rate of growth; conversely, when the horizontal dimensions of the human body are undergoing an acceleration of their rate of growth, the vertical dimension undergoes a retardation of its rate of growth.

2. The weight, at different ages during the period of growth, varies either as the product of the *height*, the *inter-acromial breadth* and the *depth* of *abdomen*, or as the product of the height, and the depth of chest *squared*.

$$(\alpha) \quad . \quad . \quad . \quad . \quad W : w :: H \times I \times A : h \times i \times a$$

$$(\beta) \quad . \quad . \quad . \quad . \quad W : w :: H \times \overline{DC^2} : h \times \overline{dc^2}.$$

3. The capacity of the lungs at different ages varies as the total muscular strength.

$$Lc :: lc :: S : s$$

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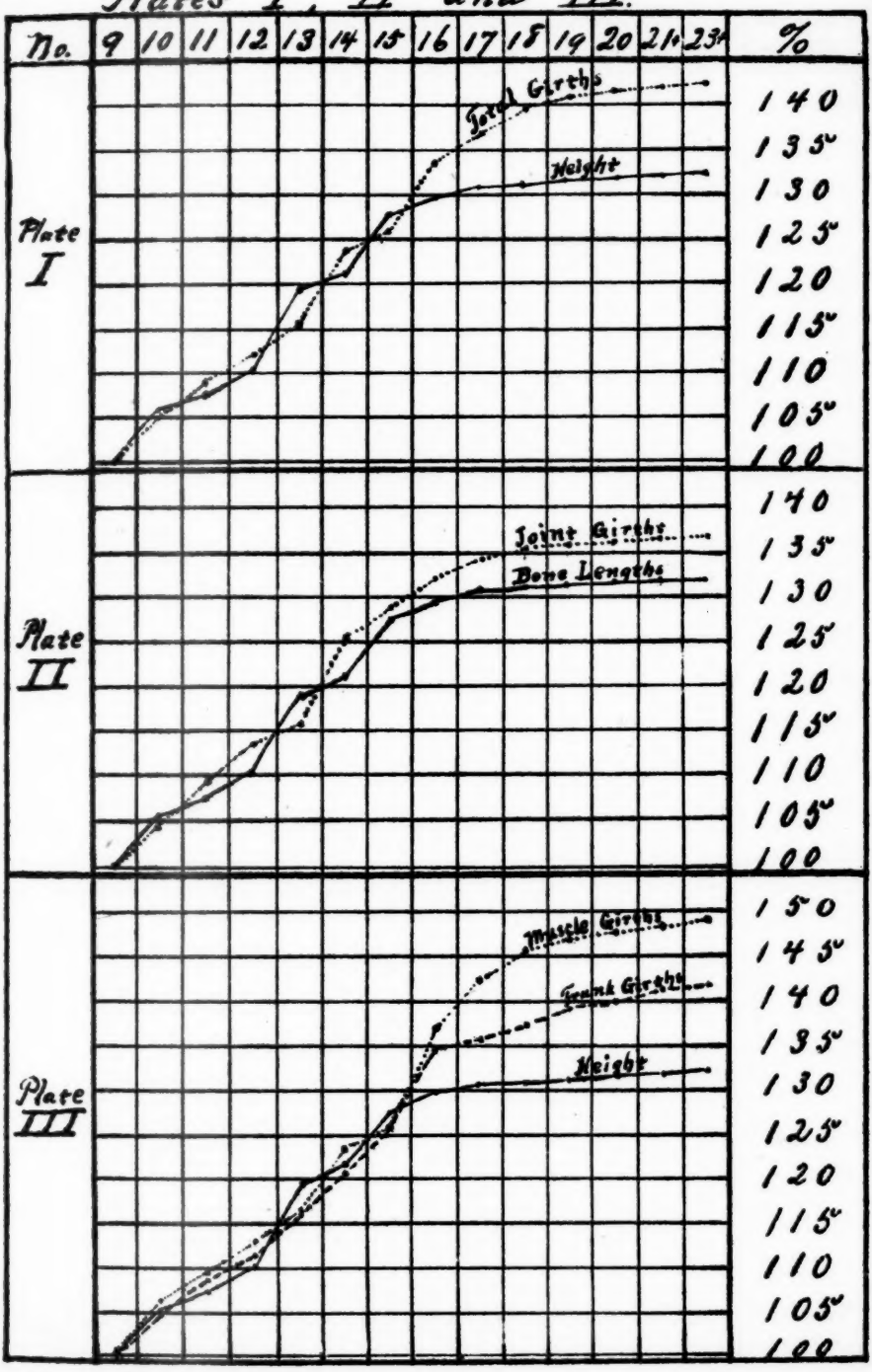
Plates I, II and III.



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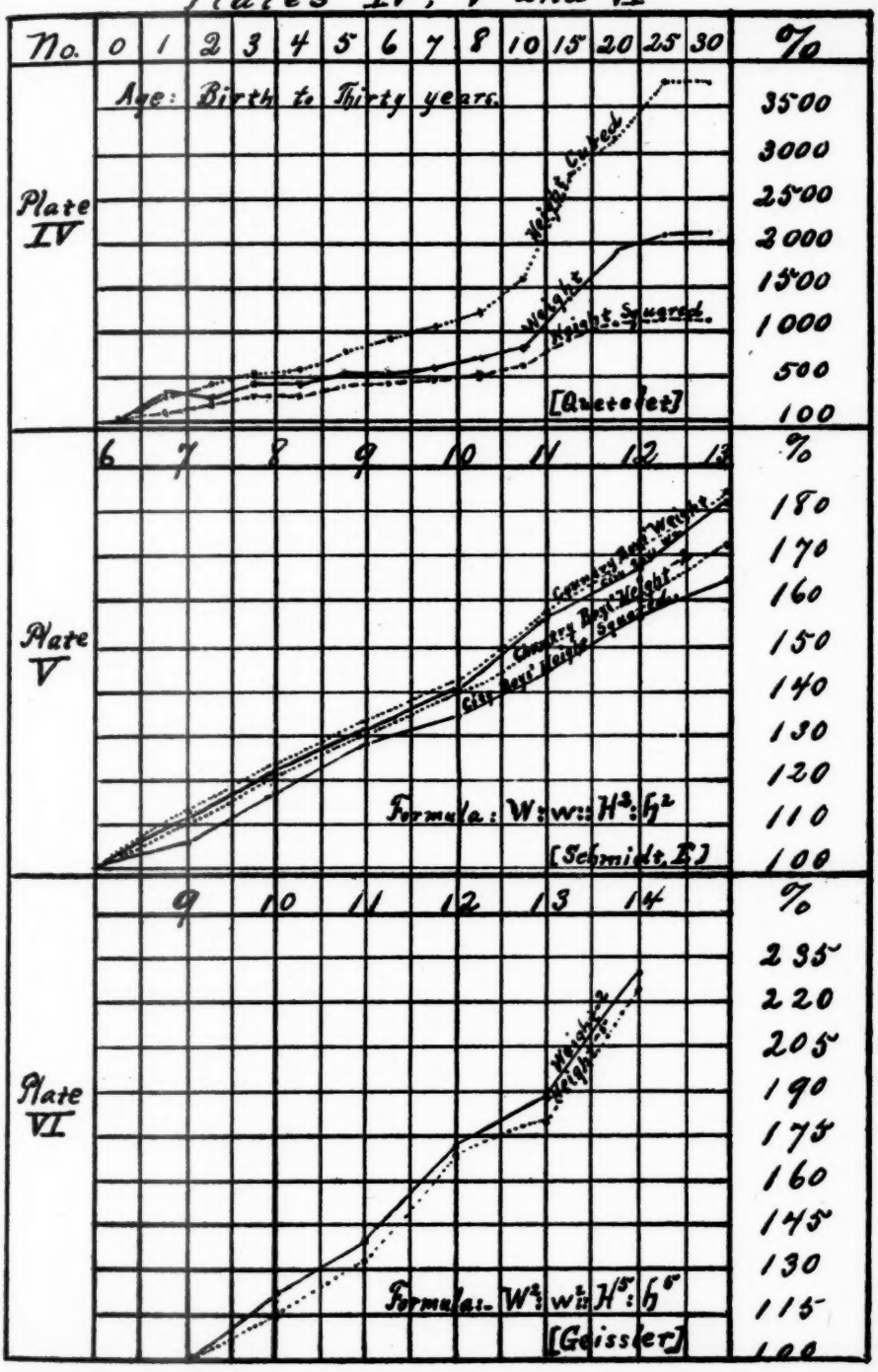
Plates IV, V and VI



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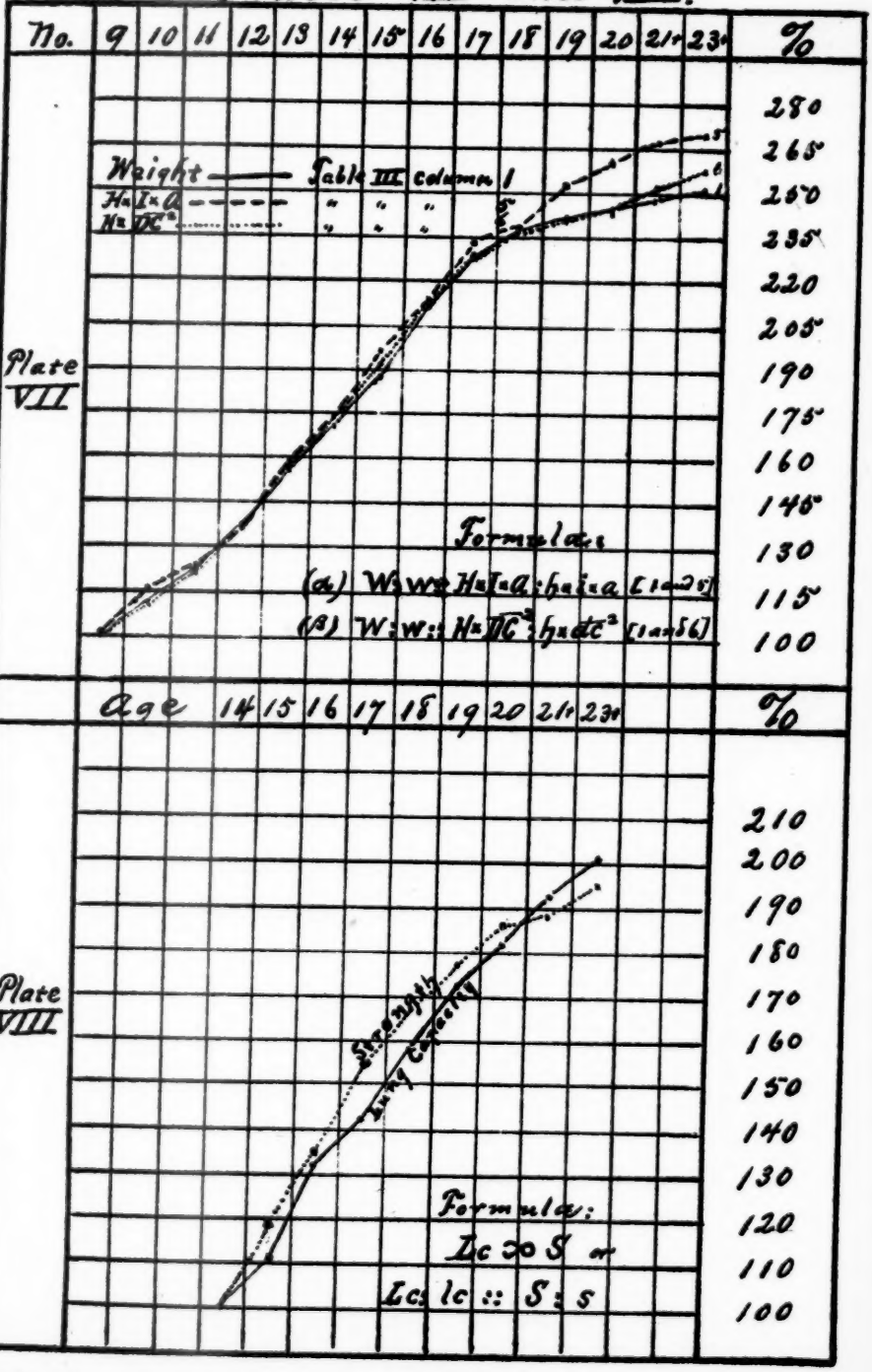
Plates VII and VIII.



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ANTHROPOMETRIC TABLE I.

No.	Age. / No. of Observations. / Measurement.	9 / 93		10 / 122		11 / 132		12 / 143		13 / 203		14 / 209		15 / 233	
		Median.	Ratio.	Median.	Ratio.	Median.	Ratio.	Median.	Ratio.	Median.	Ratio.	Median.	Ratio.	Median.	Ratio.
I	Height of body, *Modulus*	130·0	—	137·0	—	140·0	—	143·9	—	154·5	—	158·3	—	165·8	—
II	„ knee	40·0	0·308	41·9	0·306	42·9	0·306	43·8	0·304	47·0	0·304	48·0	0·303	50·3	0·303
III	„ pubes.. ..	65·0	0·500	68·0	0·496	71·0	0·501	73·0	0·507	78·5	0·508	80·8	0·510	83·7	0·505
IV	Girth of head	53·2	0·409	53·4	0·390	53·5	0·381	53·6	0·372	53·9	0·349	54·5	0·349	55·3	0·334
V	„ neck	27·0	0·208	27·5	0·201	28·0	0·200	28·7	0·197	29·8	0·193	30·9	0·195	32·6	0·197
VI	„ chest	64·0	0·491	66·0	0·482	67·8	0·484	70·7	0·491	74·2	0·481	77·7	0·490	82·1	0·495
VII	„ „ at 9th rib	59·0	0·458	63·6	0·464	64·2	0·459	66·6	0·462	70·0	0·453	71·7	0·452	74·6	0·450
VIII	„ abdomen ..	56·0	0·430	58·0	0·423	60·0	0·428	61·0	0·423	62·0	0·402	64·3	0·406	66·6	0·402
IX	„ hips	62·4	0·480	66·5	0·485	69·1	0·494	71·5	0·496	75·3	0·488	78·0	0·492	82·0	0·495
X	„ thigh ..	37·1	0·285	39·1	0·286	40·1	0·286	41·0	0·285	42·5	0·275	44·5	0·274	46·1	0·278
XI	„ knee	26·2	0·202	27·8	0·203	28·6	0·204	29·6	0·205	31·0	0·201	32·8	0·206	34·2	0·206
XII	„ calf	24·7	0·190	26·1	0·190	26·8	0·191	27·7	0·193	28·8	0·186	30·1	0·190	31·6	0·191
XIII	„ ankle	15·9	0·122	16·8	0·123	17·4	0·124	18·0	0·125	18·7	0·121	19·4	0·122	20·2	0·122
XIV	„ upperarm ..	18·7	0·144	19·8	0·145	20·4	0·146	21·3	0·148	22·5	0·146	23·9	0·151	22·5	0·154
XV	„ elbow	17·8	0·137	18·8	0·137	19 3	0·138	20·1	0·139	20·9	0·135	21·9	0·138	23·0	0·139
XVI	„ forearm ..	17·6	0·135	18·6	0·136	19·2	0·137	20·1	0·139	21·0	0·136	22·2	0·140	23·7	0·143
XVII	„ wrist	12·0	0·093	12·7	0·093	13·4	0·096	14·0	0·097	14·6	0·095	15·1	0·095	15·6	0·094
XVIII	Depth of chest	14·1	0·107	14·6	0·107	15·1	0·108	15·7	0·109	16·2	0·105	16·9	0·107	17·7	0·107
XIX	„ abdomen ..	13·7	0·105	14·4	0·105	14·7	0·105	15·1	0·105	15·7	0·102	16·2	0·102	16·7	0·101
XX	Breadth, interacromial	29·5	0·226	31·0	0·226	32·0	0·229	33·3	0·231	34·6	0·224	36·0	0·227	37·5	0·226
XXI	„ intertrochanteric	22·0	0·169	23·0	0·168	24·0	0·171	25·3	0·175	26·5	0·172	28·0	0·176	29·5	0·178
XXII	Length of upperarm ..	26·3	0·202	27·8	0·203	28·7	0·205	29·5	0·205	32·0	0·207	33·4	0·211	35·1	0·212
XXIII	„ forearm ..	34·8	0·268	36·7	0·269	37·8	0·270	39·1	0·270	40·8	0·264	42·2	0·266	44·5	0·268
XXIV	„ foot	19·7	0·152	21·0	0·153	21·7	0·155	22·5	0·156	23·9	0·155	24·5	0·155	25·5	0·154
XXV	Weight	26·5	0·204	30·0	0·219	32·5	0·232	36·5	0·254	40·7	0·264	45·2	0·285	49·3	0·297

ANTHROPOMETRIC TABLE I—*continued.*

No.	Age.	16		17		18		19		20		21 and 22		23 and over	
	No. of Observations.	284		290		240		155		130		120		90=2434	
	Measurement.	Median.	Ratio.	Median.	Ratio.	Median.	Ratio.	Median.	Ratio.	Median.	Ratio.	Median.	Ratio	Median.	Ratio.
I	Height of body, *Modulus*	168·8	—	170·5	—	171·0	—	171·4	—	171·7	—	172·0	—	172·0	—
II	,, knee	51·6	0·305	52·5	0·306	52·5	0·307	52·7	0·3075	52·8	0·308	52·9	0·308	53·0	0·308
III	,, pubes.. ..	86·7	0·509	87·0	0·510	87·2	0·511	87·5	0·511	87·6	0·510	87·7	0·510	87·7	0·510
IV	Girth of head	55·9	0·331	56·3	0·331	56·5	0·331	56·7	0·331	56·8	0·331	57·0	0·331	57·0	0·331
V	,, neck	33·5	0·199	34·3	0·201	35·0	0·205	35·4	0·206	35·6	0·207	36·0	0·209	36·0	0·209
VI	,, chest	84·4	0·500	86·6	0·508	88·4	0·517	90·3	0·527	90·9	0·529	91·2	0·530	91·5	0·532
VII	,, ,, at 9th rib	77·6	0·460	79·9	0·469	81·6	0·477	82·7	0·483	83·7	0·488	84·6	0·492	85·2	0·495
VIII	,, abdomen ..	69·5	0·412	72·4	0·425	72·6	0·425	73·0	0·426	73·7	0·429	74·8	0·435	76·0	0·442
IX	,, hips	86·0	0·509	88·4	0·518	90·0	0·526	90·3	0·527	90·6	0·528	90·9	0·528	91·0	0·529
X	,, thigh	48·9	0·290	50·9	0·289	51·6	0·300	52·0	0·305	52·2	0·304	52·2	0·303	52·2	0·303
XI	,, knee	35·0	0·207	35·5	0·208	35·8	0·209	36·0	0·210	36·1	0·210	36·2	0·211	36·2	0·211
XII	,, calf	33·4	0·198	34·5	0·202	35·1	0·205	35·4	0·206	35·6	0·207	35·7	0·207	35·8	0·208
XIII	,, ankle	20·7	0·123	21·1	0·124	21·3	0·125	21·4	0·125	21·5	0·125	21·6	0·126	21·6	0·126
XIV	,, upperarm ..	27·3	0·161	28·7	0·168	29·7	0·174	30·3	0·177	30·5	0·178	30·5	0·177	30·5	0·177
XV	,, elbow.. ..	24·0	0·142	24·8	0·146	25·0	0·146	25·2	0·147	25·3	0·147	25·4	0·148	25·4	0·148
XVI	,, forearm ..	24·7	0·146	25·4	0·149	26·0	0·151	26·4	0·154	26·6	0·155	26·8	0·155	27·0	0·157
XVII	,, wrist	16·0	0·095	16·2	0·095	16·4	0·096	16·5	0·096	16·5	0·096	16·6	0·0965	16·6	0·0965
XVIII	Depth of chest	18·2	0·108	18·7	0·110	19·0	0·111	19·0	0·112	19·3	0·1125	19·5	0·113	19·8	0·115
XIX	,, abdomen ..	17·2	0·102	17·8	0·104	18·3	0·107	18·8	0·110	19·1	0·111	19·4	0·113+	19·6	0·114
XX	Breadth, interacromial .	39·3	0·235	40·6	0·239	41·3	0·242	41·8	0·244	42·2	0·246	42·4	0·247	42·4	0·247
XXI	,, intertrochanteric	30·5	0·181	31·7	0·186	32·3	0·189	32·5	0·190	32·7	0·1905	32·9	0·191	33·0	0·192
XXII	Length of upperarm ..	36·1	0·214	36·8	0·216	36·9	0·216	37·0	0·216	37·0	0·216	37·0	0·215	37·0	0·215
XXIII	,, forearm ..	45·8	0·271	46·4	0·272	46·6	0·273	46·8	0·273	46·9	0·273	47·0	0·273	47·0	0·273
XXIV	,, foot	25·9	0·153	25·9	0·152	25·9	0·1515	25·9	0·151	26·0	0·151+	26·0	0·151	26·0	0·151
XXV	Weight	57·0	0·338	60·7	0 355	62·9	0·368	63·8	0 372	64·7	0·373	65·8	0·383	66·6	0·387

TABLE II.

SHOWING THE CHANGES OF PROPORTION BETWEEN LENGTHS AND GIRTHS.

Measurement.	9	10	11	12	13	14	15	16	17	18	19	20	21–22	23+
Height of body—Modulus ..	130·0	137·0	140·0	143·9	154·4	158·5	165·8	168·8	170·5	171·0	171·4	171·7	172·0	172·0
LENGTH MEASUREMENTS.														
Height of knee	40·0	41·9	42·9	43·8	47·0	48·0	50·3	51·6	52·2	52·5	52·7	52·8	52·9	53·0
,, pubes	65·0	68·0	71·0	73·0	78·5	80·8	83·7	86·7	87·0	87·2	87·5	87·6	87·7	87·7
Length of upperarm	26·3	27·8	28·7	29·5	32·0	33·4	35·1	36·1	36·8	36·9	37·0	37·0	37·0	37·0
,, forearm..	34·8	36·7	37·8	39·0	40·8	42·2	44·3	45·8	46·4	46·6	46·8	46·9	47·0	47·0
,, foot	19·7	21·0	21·7	22·5	23·9	24·5	25·5	25·9	25·9	25·9	25·9	26·0	26·0	26·0
Total	185·8	195·4	202·1	207·8	222·2	228·9	238·9	246·1	248·3	249·1	249·9	250·3	250·6	250·7
JOINT GIRTHS.														
Girth of knee	26·2	27·8	28·6	29·6	31·0	32·8	34·2	35·0	35·5	35·8	36·0	36·1	36·2	36·2
,, ankle	15·9	16·8	17·4	18·0	18·7	19·4	20·2	20·7	21·1	21·3	21·4	21·5	21·6	21·6
,, elbow	17·8	18·8	19·3	20·1	20·9	21·9	23·0	24·0	24·8	25·0	25·2	25·3	25·4	25·4
,, wrist	12·7	12·7	13·4	14·0	14·6	15·1	15·6	16·0	16·2	16·4	16·5	16·5	16·6	16·6
Total	72·6	76·1	78·7	81·7	85·2	89·2	93·0	95·7	97·6	98·5	99·1	99·5	99·8	99·8

TABLE II—*continued.*

TRUNK GIRTHS.

Measurement.	9	10	11	12	13	14	15	16	17	18	19	20	21–22	23†
Girth of chest VI..	64·0	66·0	67·8	70·7	74·2	77·7	82·1	84·4	86·6	88·4	90·3	90·9	91·2	91·5
„ „ VII	59·6	63·6	64·2	66·6	70·0	71·7	74·6	77·6	79·9	81·6	82·7	83·7	84·6	85·2
„ abdomen	56·0	58·0	60·0	61·0	62·0	64·3	66·6	69·5	72·4	72·6	73·0	73·7	74·8	76·0
„ hips	62·4	66·5	69·1	71·5	75·3	78·0	82·0	86·0	88·4	90·0	90·3	90·6	90·9	91·0
Total	242·0	254·1	261·1	269·8	281·5	291·7	305·3	317·5	327·3	332·6	336·3	338·9	341·5	343·7

MUSCLE GIRTHS.

Girth of thigh	37·1	39·1	40·1	41·0	42·5	44·5	46·1	48·9	50·9	51·6	52·0	52·2	52·2	52·0
„ calf	24·7	26·1	26·8	27·7	28·8	30·1	31·6	33·4	34·5	35·1	35·4	35·6	35·7	35·8
„ upper arm	18·7	19·8	20·4	21·3	22·5	23·9	25·5	27·3	28·7	29·7	30·3	30·5	30·5	30·5
„ forearm	17·6	18·6	19·2	20·1	21·0	22·2	23·7	24·7	25·4	26 0	26·4	26·6	26·8	27·0
Total	98·1	103·6	106·5	110·1	114·8	120·7	126·9	134·3	139·5	142·4	144·1	144·9	145·2	145·3

Height, reduced	100·0	105·4	107·7	110·3	118·5	122·0	127·5	129·8	131·1	131·6	131·9	132·1	132·3	132·3
Lengths „	100·0	105·2	108·7	111·3	119·6	123·4	128·6	132·6	133·6	134·0	134·6	134·7	134·9	135·0
Joint girths „	100·0	104·9	108·4	112·6	117·2	125·7	128·1	131·9	134·5	135·6	136·5	137·0	137·4	137·4
Trunk „ „	100·0	105·0	107·9	111·6	116·3	120·7	126·2	134·3	135·3	137·4	139·0	140·0	141·0	142·0
Muscle „ „	100·0	105·6	108·5	112·4	117·0	123·0	126·4	136·9	142·2	145·2	146·9	147·6	148·0	148·2
Total „ (average)	100·0	105·2	108·3	112·2	116·8	123·1	126·9	134·3	137·3	139·4	140·8	141·5	142·1	142·5

TABLE III.

THE RELATION OF THE WEIGHT TO THE LINEAR DIMENSIONS, AND OF LUNG CAPACITY TO STRENGTH.

Age.	1 Weight. Reduced to a percentage series.	2 Interacromial Breadth. Squared and Reduced.	3 Interacromial Breadth. Cubed and Reduced.	4 Height × Depth, Chest × Breadth Hips. Reduced.	5 Height × Interacromial × Depth Abdomen. Reduced.	6 Height × Depth Chest, Squared. Reduced.	7 Lung Capacity. Reduced.	8 Lung Capacity. Reduced from 14 years.	9 Strength. Reduced.
9	100·0	100·0	100·0	100·0	100·0	100·0	100·0		
10	113·2	110·5	116·0	113·2	115·5	112·1	110·3		
11	122·7	117·4	127·6	127·7	124·4	122·6	120·6		
12	137·7	127·4	143·7	140·8	135·9	136·3	132·3		
13	153·6	137·5	161·4	163·1	158·4	155·6	154·4		
14	170·9	148·8	181·8	188·8	174·2	173·8	178·0	100·0	100·0
15	180·6	161·6	205·4	200·6	196·1	190·8	198·5	111·4	119·3
16	215·1	177·5	236·4	230·6	215·5	214·7	235·3	132·1	134·5
17	229·0	189·3	257·1	248·7	232·7	228·9	254·4	142·9	154·6
18	237·3	196·0	274·4	258·2	237·4	237·0	274·4	157·7	166·9
19	240·8	200·7	284·5	261·4	254·4	240·0	307·7	173·4	177·8
20	244·5	204·4	292·7	266·6	261·3	245·5	323·6	181·7	186·6
21+	248·3	206·6	295·9	271·5	267·3	251·1	341·7	192·0	188·7
23+	251·3	206·6	295·9	274·3	270·3	259·2	360·3	202·3	195·4

TABLE IV.—STRENGTH.

Age.	14	15	16	17	18	19	20	21+	23+
	kilos.	kilos.	kilos.	kilos.	kilos.	kilos.	kilos.	kilos.	kilos.
Back ..	88	105	112	123	131	140	145	146	148
Legs.. ..	114	125	146	162	168	178	190	195	209
Chest ..	31	35	40	43	46	48	50	50	50
Upperarm ..	27	44	51	77	92	100	100	100	100
Forearm ..	24	33	33	34	37	41	45	45	45
Total ..	284	339	382	439	474	505	530	536	550

NOTES *on the* LANGUAGES SPOKEN *in* MADAGASCAR.

By J. T. LAST.

Origin of Language, general belief, Malagasy, of African or Arabic origin.—From the time since Madagascar first became known to Europeans, until a comparatively recent date, there was a general impression and belief that the inhabitants of the island came originally of an African stock, and that the language, if not African, was a corrupted form of Arabic. There was much to induce and sustain this belief especially in earlier days, when the language of the Malagasy was but little known, even by those who wrote and spoke about it. Certainly Arabic was understood by many in those days, but none of the writers on Madagascar had any knowledge of the East African tribes and languages, especially Swahili and Makua, through which the African element, if any, would most probably have come to Madagascar; and but little was known of the languages of the far east; so far indeed, that none would naturally think that the Malagasy owed their origin and language to such a distant place.

It was most natural that people should regard Africa as the original home of the Malagasy, if only on account of its approximate nearness, besides the general appearance of the Western Malagasy seemed to point that way. It was also quite reasonable in those days when the study and comparison of languages was so little followed, that people should conclude that Malagasy was a corrupted form of Arabic, judging from the number of Arabic forms and words in use in the language, even some recent writers have endeavoured to maintain "that Malagasy is an African language." Let us see how far such a view concerning the Malagasy language can be supported.

First knowledge of Madagascar; a possibility that Madagascar may have been reached by Arabs before the Christian era.—There is no known record bearing testimony to a knowledge of the existence of the island of Madagascar before the beginning of the Christian era: there is little or nothing to show that the East Coast of Africa, south Cape Guardafui, was known before that time. But when it is known that ships passed up and down the Red Sea and along the Arabian coast, to the Persian Gulf probably, and perhaps to India, it is quite reasonable to suppose that some of the ships or dhows may have also rounded Cape Guardafui, and sailed down the East African coast, and it is almost as reasonable to think that if they went so far they may also have reached the Comoro Islands and Madagascar.

First century—Theophilus and Diogenes; Dioscorus.—Shortly after the commencement of the Christian era, two navigators, Theophilus and Diogenes, passed Cape Guardafui, and reached the port of Rhapta, by some thought to be the same as the present Zanzibar, but more probably a point near Mozambique in about latitude 15° S. Soon afterwards the pilot Dioscorus, doubled Cape Guardafui and proceeding still further south arrived at Cape Prasum in about latitude 22° S. near the mouths of the Zambezi river.

Second century—Ptolemy.—In Ptolemy's time, second century, the passage between Cape Guardafui and Cape Rhaptum was apparently frequently made, the merchants who were questioned by him stating that the voyage between the two places was generally made in fifteen days.

Third century—Arrian Menuthias=Madagascar.—From the description given by Arrian there is much reason to think that when he speaks of the island of Menuthias, he is referring to Madagascar. His remarks would scarcely apply to any other island off the East African coast, his description of the rivers, crocodiles, land-tortoises, canoes, sea-turtles and wicker-work weirs for catching fish, apply exactly to Madagascar of the present day but to none of the other islands.

Tenth century—Masudi. Djafouna=Madagascar.—For six hundred years after the time of Arrian and Marcian there is little or no reference made to Menuthias or any island which would lead one to think that Madagascar was alluded to—but Masudi, in his book, "Moroudj ad-Dhahab," speaks of the sea of the countries of "Berbera, and Djafouna," and the island of Kanbalou. Probably the island of Kanbalou is Anjouan or one of the Comoro islands, and Djafouna is the island of Madagascar. It is scarcely possible that Kanbalou can refer to Madagascar, for that island has never been ruled by Arabs or their descendants, whereas the Comoros have been gove ned by

Arabs and their descendants for many centuries. Masudi says that Kanbulou was conquered by the Arabs in 750 A.D.

Twelfth century—Edrisi. Chezbezat = Madagascar.—Another two centuries are passed, and we find Edrisi, in his work "Nozhat al-Moschtak," describing several islands which lie off the East African coast. When speaking of the smaller islands he evidently refers to the Comoros, the island Andjiyeh pointing to Anjouan, and Chezbezat to Madagascar. Edrisi speaks of the pearls, sugar cane, and other things found in or about Chezbezat. It is well known to all who have travelled along the west coast of Madagascar, that pearl-oysters are to be found near the coast nearly the whole length of the island.

Thirteenth century—Marco Polo. Madagascar refers probably to Magadoza.—From the time of Edrisi to that of the celebrated Venetian traveller, Marco Polo, little was added to what was already known of the island we call Madagascar—but several names are given by various writers which may refer to that place, as, Komr, Serendah, El-Komr, Malichu and Mahal. The first writer who uses the name of Madagascar, or rather Madeigascar, is Marco Polo, but even he could scarcely have been speaking of the island now known by that name, it is far more probable he was referring to the district and town of Magadoza, on the east coast of Africa, south of Cape Guardafui. He was under the impression that the place was an island, but the remarks he makes about elephants and camels are sufficient to show that he could scarcely have been referring to the island of Madagascar.

Madagascar discovered by Fernam Saares and Joas Gomez d'Alreu in 1506, *or perhaps a little earlier.*—Previous to Marco Polo's time all the information we have of Madagascar is from Arabian sources. After him a number of Europeans made maps and wrote of the place, but added nothing to previous knowledge, and it was not till the beginning of the 16th century, when the island was discovered by the Portuguese, that we get any definite and reliable information about Madagascar.

Marco Polo's statement. Portuguese navigators. 1650, *Manuel de Faria. The word "Buqua." Sakalavas unacquainted with African languages.*—The statement made by Marco Polo went far to establish the idea that the language of the people of Madagascar is a form of Arabic, when he asserted that "its inhabitants follow the laws and customs of Muhamed." Since that time, till quite recently the prevailing idea regarding the origin of the language, was, that it was either derived from an African source, or that it was a corrupt form of Arabic. The Portuguese navigators who explored its coasts in the 16th and 17th centuries, thought the language of the people was African;

and one of them, Manuel de Faria, in 1650 states that "from Massalege to Sadia" (on the west coast, viz., between Narendry Bay, latitude 14° 14′ S., and the Sadiha River in about latitude 19° 10′ S.) "the natives speak the same language with the Kafirs on the opposite coast of Africa, while in all the rest of the island, the native language, called 'Buqua,' is spoken." The use of this word "Buqua," which is only the Portuguese form of the Malagasy word "Boký," or "Buk" (as it might more correctly be spelt)=meaning a small animal of the mongoose family; points to the kind of people with whom the Portuguese associated whilst in Madagascar. This word is never used by the Malagasy in any reference to themselves or their country, but it is always used by the Swahilis and Arabs of Zanzibar and other places to denote the people and island of Madagascar. They have no other name for it. For instance, they say, "Mtu wa Bukini"=lit., a man of the place where the mongoose is, a man of Bukini, a man of Madagascar, or, Ntakwenda Bukini=I shall go to Bukini, or Madagascar. The final -ni, of Bukini, is only the Swahili locative suffix, the real word is "Buki." This word is known more or less all along the west coast, but the Sakalavas, the natives of that part of the country, never use it in reference to themselves, but simply to denote the animal of which it is the name. In the same manner, the Swahili give the Sakalavas the name of Makalalao=cockroaches. This use of the word Buki, or Buqua, shows that the Portuguese explorers must have met and associated with the Swahili-Arabs on the coast, and not with the real natives, and having already formed an acquaintance with the language spoken by the Swahili-Arabs on the east coast of Africa, they did not stop to consider whether the persons they talked with were real natives or simply immigrants, but at once, supposing them to be *bonâ fide* natives, concluded that the native language in that part of Madagascar was similar to that used on the opposite African coast. It would not be possible for the Portuguese to have been talking with pure Sakalavas and conclude that they were using a language similar to an African one, for the Sakalavas never learn a foreign tongue. Even at the present time one may travel the whole length of the west coast, and not be able to meet with a real native who can speak or understand Arabic, or Swahili, or any other East African tongue. It may generally be said that the Malagasy natives never learn the language of the foreign element, but the foreigners have to learn that of the natives.

Dr. Vanderkemp, 1812.—In this manner, with one or two notable exceptions, the view generally held, till the beginning of the present century, was that Malagasy was a language of

African or Arabic origin. In 1812, Dr. Vanderkemp writes, "The Madagascar tongue, it appears, is a corruption of the Arabic," and still later on writers have appeared who have held a similar view. This general opinion regarding the origin of the language is easily accounted for, first from the general appearance of things, and secondly, from the inability (through want of proper material) of those who wrote and spoke on the subject, to investigate the question thoroughly.

African and Arabic influence twofold.—The Arabic and African influence in Madagascar, and on its language must be regarded in two distinct parts. There was that which had to do with the north-west, and afterwards the greater part of the west coast, which might be called the Swahili-Arab element; and there was also that which operated on the south-east coast of Madagascar, probably a pure Arabic element. These were quite distinct immigrations and had quite distinct influences.

Very few if any pure Arabs in Western Madagascar. Swahili-Arab=people of mixed African and Arab origin in East Africa and the Comoro Islands.—Probably the earliest Arab visitors in Madagascar first touched somewhere on the north-west coast. They simply came, traded and went off again. They did not settle then, and probably for many centuries, it may be, the Arabic and African influence in this part of the country was simply that of traders. It is quite possible, that it is only within the last two or three centuries that people of an Arab or African origin have settled in the western parts of Madagascar. Of pure Arabs, it is highly probable, that only a very few, if any, ever settled in this part of the island. Those who came were either members of the mixed race called Swahili, or men from the Comoro islands, who, though they were proud of their Arab origin, and are so to the present day, are yet just as much a mixed race, as the Swahilis themselves. At the present day I think it would be almost impossible to find a pure Arab on the whole west coast of Madagascar, though probably the African bred Arab or Swahili, and those from the Comoro islands may be numbered in some thousands. Many of these understand Arabic somewhat, but Arabic is not their language. They all speak a kind of Swahili, a language as mixed in its origin as the speakers are in theirs. This language is spoken all along the east coast of Africa from the equator to Lindi in latitude 10° S., in all the islands along the coast, and in all the islands of the Comoro group. Each district has its own dialect; that of Lamu differs from that of Mombasa, the dialect spoken in Zanzibar is different again, and so on all along the coast line. The coast islands and the Comoros each have their dialects, and each island differs somewhat from its neighbour.

Makua slaves.—There is also a large body of pure Africans in the western part of the island—but they are probably of a very recent importation. These are Makuas chiefly, and have been brought into the country by the Swahili-Arab element, as slaves. Their presence has had little or no effect on the language. They being slaves, their masters, the Sakalavas, would be far too proud to adopt any of the Makua words into their vocabulary.

African and Arab words of a kind such as would be expected.—In examining the Malagasy language as spoken on the west coast, we find just what would naturally be expected, viz., a considerable number of words of African and Arab origin, but all in a Swahili form or dress, and they are also the kind of words which one would expect to find introduced by traders and non-settlers. The purely African words in use in Malagasy are very few indeed, and there are none, I believe, that we may not reasonably consider to have come into Malagasy use, through a Swahili-Arab channel. I see no reason why such words as "omby" = cattle; Swa. "ng'ombe," and "Amboa" = dog; Swa.="Mbwa," should not have been introduced by the Swahili-Arab trader. Who introduced the cattle if not these people? They must have come from Africa, and what more likely than that they were brought by the early traders, that the natives had no word for such an animal, and therefore adopted the name as well as the animal. So also it may have been with the dog.

African and Arab words fall naturally within three classes.—The foreign words in use in the Malagasy spoken on the west coast, can all be arranged in the three following classes—

First Class,—a very few words.—Pure African words for which the Malagasy have no equivalents, as—

Kanga	Mal.	*akanga*	=guinea-fowl.	*Mbwa*	Mal.	*amboa*	=dog.
Ng'ombe	,,	*omby*	=cattle.	*Mananazi*	,,	*mananasa*	=pineapple.
Ntango	,,	*voa-ntango*	= a gourd.	*Kuku*	,,	*akoho*	=fowl.

The purely African words for which the Malagasy have no equivalent are very few in number—and all are such as might reasonably have been introduced by traders.

Second Class—African and foreign words used in Madagascar by the Swahili-Arab traders only—for which there are Malagasy equivalents in use, as—

Foreign.	Malagasy.	English.	Foreign.	Malagasy.	English.
Papango ..	*tsimalaoky*	kite.	*Mamba* ..	*voay* ..	crocodile.
Gora ..	*pako* ..	an uncut piece of cloth.	*Zamani* ..	*taloa* ..	ancient.
			Mohogo ..	*balahazo* ..	cassava.
Dawa ..	*fanafody* ..	medicine.	*Seramalla*	*mpandrafitra.*	carpenter.
Moto ..	*afo*.. ..	fire.			
Karani ..	*mpancrota*..	a writer.	*Rafiki* ..	*sakaiza* ..	friend.

There are several other words which might be collected belonging to this class.

Third Class.—African and other words connected with trade and likely to be in common use with traders, for which the Malagasy have no equivalents, as—

Foreign.	Malagasy.	English.	Foreign.	Malagasy.	English.
Kanzu ..	*akanjo* ..	the long Swahili dress.	*Pingu* ..	*ampaingo* ..	fetters.
			Karafū ..	*karafoy* ..	cloves.
Tende ..	*antrendry* ..	dates.	*Ng'ombe* ..	*omby* ..	cattle.
Nahotha ..	*nahotha* ..	captain.	*Sahari* ..	*sahary* ..	a kind of cloth.
Sahani ..	*sahaný* ..	plate.			
Sukari ..	*sokary* ..	sugar.	*Kaniki* ..	*kaniky* ..	a kind of blue cloth.
Bakuli ..	*bakoly* ..	basin.			
Hariri ..	*hariry* ..	silk.	*Karatasi*	*taratasy* ..	paper.
Robo ..	*kirobo* ..	a fourth part	*Mizani* ..	*mizaný* ..	scales.
			Nussu ..	*loso* (?) ..	half.

It is highly probable that all the African words in use in Western Madagascar can be embraced in one or other of the above three classes, and if so, they cannot be produced as showing evidence of a primary African element in the Malagasy language, or that the Madagascar aborigines came of an African stock; they much rather tend to prove that the African element was introduced at a much later date. If a collection and study of all the African words in use in Madagascar should show that they have come through a Swahili-Arab channel (and I believe this would be the result of such a study) it would be a proof that some other language than an African one was primarily used in Madagascar, and that the Malagasy language is only indebted to Africa for a few loan words.

Kind of words necessary.—Further, the kind of words used is another indication of the comparative age of the African

element in Malagasy. If we had found African words in the language, expressing numbers, parts of the body, natural elements, common things and everyday actions, there would have been some reason to think that the present Malagasy language was founded on some old African form, but we do not find anything of the kind; all words in use describing such ideas, can be traced to quite a different source.

Construction of languages compared.—Again, the construction of a language should tend to show something of its origin. The construction of all the Eastern Bantu languages in East Africa may be said to be the same, but take any one of these and compare it with Malagasy, and it will be found that they have but little or nothing in common. I think it may be safely said that the African element in Malagasy does not in any way prove or even point to the theory that Madagascar was first peopled by an African race, speaking an African language. The sum total of the influence of the African and Arab languages on the western parts of Madagascar, has been to introduce a number of words, of which some few have been adapted and incorporated into Malagasy, as loan words, the others still remain in the lender's hands.

Theory that Malagasy is a corrupted form of Arabic. What induced that idea; European contact with Swahili-Arabs instead of with real natives. Mujangà.—As I have previously remarked the theory that Malagasy was a corrupted form of Arabic was held from the time of Marco Polo, till far into the present century. There was much that tended to induce that idea, especially when Madagascar and its language was but little known. Most of the Europeans who visited the west coast came more in contact with the Swahili-Arabs located there, than with the real natives, and as these would use a language freely sprinkled with Arabic words, those Europeans would naturally conclude that the language they had heard was a kind of Arabic. The same mistake might happen to-day. Suppose a man without any previous knowledge of Madagascar or its language were to go ashore at Mujangà, one of the largest towns on the west coast, and there collect a vocabulary of the language from a number of the people, and then submit his collections to a scholar acquainted with Arabic, that scholar would undoubtedly conclude that the language was either a corrupted form of Arabic or allied to it. And why? Because the collector of the words obtained them from the Swahili-Arabs, who occupy the greater part of many of the principal towns on the west coast, such as Mujangà, Ancrontsanga and other places, and who, though they understand Malagasy, prefer to speak in their own

language. The Sakalavas, the true Malagasy of the west coast, shun the large towns, where the Hovas have a station, and prefer to live in the smaller villages inland, or in isolated places along the coast.

Arabic words amongst Sakalavas.—In addition to the above, the few Arabic words which are in use amongst the Sakalavas and others on the west coast, words denoting the days of the week, and the months, as well as trader's words, would at first sight induce most people to think that Malagasy was somewhat allied to Arabic.

Arabs in South East Madagascar.—Having shown thus far the improbability of there having been an African element in the original language spoken in Madagascar, and traced to some extent the influence of the Arabic language introduced on the west coast, we must now go further and take up the subject in an opposite part of the island—the south-east districts.

Arab influence of another kind.—The Arabic influence on the south-east coast was of a somewhat different nature to that exercised on the west coast. The circumstances of the Arabs were different. Those who came to the west coast, came only as trading visitors, and their presence chiefly affected the language in matters regarding trade. Not so on the south-east; the Arabs who came there had brought their all with them, and they had come to stop. They probably came in considerable numbers, for nearly all the south-east tribes claim their descent from them; and that they gained an ascendancy over the natives either by force or superior skill, there can be no doubt, for in the course of time their permanent residence in the island affected the whole social system of the Malagasy.

Number of Arabic words and ability to read and write in Arabic.—In this part of Madagascar we see much that would lead people to think that a relationship existed between the Arabic and Malagasy languages. This might at first sight seem to be indicated by the considerable number of words which have been introduced by the Arabs who came and settled in this part of Madagascar; also by the fact that many of the natives from ages past down to the present time, have been able to write and read a kind of Arabic, and also to decipher a number of old Arabic manuscripts they have in their possession, and which they guard with the most jealous care.

Nature of Arabic words. First Arabs come to South East Coast not later than 700 *or* 750 A.D. (*probably*); *Astrology and Divination.*—Upon investigation, we find here, as we did on the west coast, that the words which have been introduced

were just such as might have been expected from the Arabs of their time and under their circumstances. It is well known that shortly after the time of Muhamed, all Arabia was distressed by fierce and continued oppression, and many were compelled to leave their country and seek new homes in distant lands. What is more likely than that these Arabs who came to South East Madagascar should be some of those who had given up their fatherland rather than adopt the new religion of Muhamed? Their system of astrology and divination was their religion, and this they brought with them. In the course of time this astrology and divination was introduced amongst the natives and accepted by them, and the Arabic words necessary for expressing the various ideas of the system were incorporated into the Malagasy language.

Kind of Arabic words.—Thus we find that the majority of the words which have been introduced by the Arabs on the south-east coast are those connected with chronology, astrology, divination and kindred subjects, together with some others which refer to music, writing and books, and perhaps a few common words.

Chronological terms.—In chronology, Arabic gives us the names of the days of the week, which are the same throughout the island, also the names of the days of the month, and the names of the months. These names of the month do not follow the Arabic month names, but, according to Professor Fleicher, the Arabic names of the constellations in the Zodiac—the day names of the month being taken from the Arabic names of the principal stars in the above constellations.

Astrological.—In astrology and divination we have Arabic words used to express nearly all the terms employed in the mysteries of Sikily, Vintana and San-andro.

Musical.—In music, there are several names of musical instruments evidently derived from Arabic.

Paper, books, &c.—Arabic words are used to express such things as books, paper, sealing-wax, pictures, and similar things.

These are just the kind of words one would expect to find introduced into Malagasy by Arabs who came as settlers, and obtained a permanent, but not an absolutely dominant position.

Nothing to show that Malagasy is derived from an African or Arabic source.—To sum up the above evidence, we may safely conclude that the Malagasy language was not originally derived from either an African or Arabian stock, and secondly, that the presence of Swahili-Arabs, on the north-west coast, and Arabs on the south-east, has affected the language only to

the extent of introducing a number of loan words, and these are just such words as one would expect to find incorporated in the language, when we consider the circumstances of the persons who introduced them.

The Eastern Archipelago the true source of the Malagasy people and language. Various writers.—We must now turn our attention to that part of the world, which is undoubtedly the source of the Malagasy language and people. Although most writers, previous to the present century, held that the Malagasy language owed its origin to an African or Arab source, and some even in late years have persisted in the same view yet from an early date, there were a few who held a different opinion on the subject. Nearly three hundred years ago both Houtman and Gothardus Arthusius showed that there was a relationship between Malagasy and the Malayan languages. Later on Reland and Captain Cook noticed the same similarity existing between Malagasy and Malayan words. Still later, Marsden, Baron W. von Humbolt and Freeman showed that Malagasy could claim a relationship, in both words and construction, not only with Malayan, but also with most of the languages spoken in the Melanesian, Micronesian and Polynesian group of islands in the far East; and now during quite recent years, the investigations and writings of Dahle, Cousins, Richardson and others have confirmed this view, and to them I am indebted for much of the information embodied in the following remarks on this part of my subject.

Improbable from a geographical point of view.—Looking at the question from a geographical point of view, this conclusion is quite the reverse of what might have been reasonably expected when we consider how comparatively near Madagascar is to Africa, and the vast distance intervening between that island and the Malayan Archipelago.

Value of words as evidence.—One of the first branches of evidence, though perhaps of a doubtful value, is the number of words which are common to the languages under discussion. But as I have said regarding the African and Arabic words found in Malagasy; it is the kind of word rather than the number, that is of value in an inquiry of this nature. In this case, however, the words held in common are eminently suited to establish the theory that Malagasy is a branch of the great Malayo-Polynesian family of languages.

Let us first consider the words employed to express the numerals from one to ten.

Nature of evidence.—In a list of 33 languages taken from Mr. A. R. Wallace's book, "The Malay Archipelago," we find that

1. *Numerals.*—

Languages.			Malagasy.	
For one ..	22 have some form of ..	*sa* ..	*isa*	or *raiki.*[1]
„ two ..	30 „ „ „ ..	*rua* ..	*roa*	„ *rua.*
„ three ..	27 „ „ „ ..	*tol* ..	*télo*	„ *telu.*
„ four ..	33 „ „ „ ..	*pat* ..	*efatra*	„ *efatsi.*
„ five ..	32 „ „ „ ..	*lima* ..	*dimy*	„ *dimi.*
„ six ..	30 „ „ „ ..	*an*	*enina*	„ *enina.*
„ seven ..	27 „ „ „ ..	*pitu* ..	*fito*	„ *fitu.*
„ eight ..	24 „ „ „ ..	*walu* .	*valo*	„ *valu.*
„ nine ..	29 „ „ „ ..	*sio* ..	*sivy*	„ *sivi.*
„ ten ..	12 „ „ „ ..	*pulu* .	*folo*	„ *fulu.*

[1] I quite agree with Dr. Codrington, in objecting to the use of the letter *y* as a final form for *i*, and seeing that there are both *o* and *u* sounds in Malagasy, it is to be regretted that the one vowel *o* has been made to do duty for both.

2. *Use of common words.*—The above comparison of numeral forms might be considered sufficient evidence to prove a kind of relationship between Malagasy and the languages spoken in the Malayan Archipelago, and Cousins produces a list of words which in themselves, considering their kind, ought to be sufficient to remove all doubt. He says,[1] "We find also, such words as people, body, head, back, hands, thigh, breast, eyes, nose, ears, forehead, lips, hair, teeth, heart, kidneys, liver, bone, muscle, blood and veins. Then we meet with mother and child, male and female. We also find words for the day and night, for year, for the sun, moon and stars, for the gentler breezes and for strong wind, for stone, earth and sand, for fire and water, for sea, waves and probably river, for clouds and rain, for promontory or headland, and perhaps for hill. In the animal kingdom we find names for bird, for crow, for cat, crocodile, and chameleon, for worm, leech and cray-fish, for fly, locust, mosquito, and spider. We also find a word for horn. In the vegetable kingdom we find names for tree, forest and seed, for the midrib of the banana leaf, for the banana itself, for the mango and fig, for the cocoanut, the bamboo, the yam, the mushroom, and possibly the chili. We find also names for lead, and charcoal, and possibly for iron. Words also exist for weaving, smoothing, sharpening and digging, for gazing, weeping, hanging and killing, for scratching, scraping, squeezing, sucking, coughing, sleeping, choosing, opening, growing, and also for bathing and swimming. We find also such words as house, wall (of a house), to dwell, bed, trivet, pot, knife, spit, staff, road, bridge, canoe and sail,

[1] Extract from paper in "Ant. Ann.," iv, pp. 416, 417.

also for food, meat, fish, egg, salt, fat, rum, and possibly rice. Then we meet with the simple adjectives, soft, warm, sweet, bitter, blunt, cheap, raw, ripe, thin, dead, alive, red, black, white, yellow, and perhaps blue. All these have been identified with a fair amount of probability; and from the simple notions, they, for the most part, express, we may, I think, conclude that they belonged to the original language of the Malagasy people, and that, therefore, their language was a member of the Malayan family."

But still further and perhaps more conclusive proof is found by a comparison of the construction and use of the words in the Malagasy language with those spoken in the Eastern Archipelagos.

3. *The connecting letter* -*n*-(-*m*).—In compound words the letter -*n*- (sometimes changed into -*m*-) is used in Malagasy as a euphonic connecting link, as in *vava-m-boro*=a bird's beak, and *voa-n-kazo*=fruit (of a tree) or *volombava* for *volo-n-vava*, or *vola-ni-vava*=hair of the mouth. In the Nias language, the same form is used as *bu-m-bawa*, with the same meaning.

4. *The infixes.*—The infixes in Malagasy are, *in*, *on*, *om*, *ol*, *ar*, *er*, and probably others. This form and use of a particle is not found in any of the Polynesian or Melanesian languages, but only in the Malayan group. Infixes similar to the Malagasy ones are found in all the Malayan languages, but most frequently met with in the Tagala family, where the forms in use are um, and in, and have probably a more extended meaning than the infix forms in Malagasy.

5. *The Definite Article.*—The Malagasy definite article is *ny*. In the languages spoken on twenty-seven of the Melanesian islands, the letter *n* appears in the definite article.

6. *The Personal Article.*—The Malagasy personal article is *i*. This is found in the languages spoken on ten of the Melanesian islands, and is used in the same manner as with the Malagasy. Probably the Javanese *si*, is only another form of the same word, the Malagasy having dropped the initial *s*, according to their custom in dealing with words of Javanese and Malayan origin.

7. *The Genitive Case.*—The principal modes of expressing the genitive case in Malagasy are, by adding an *n*, or (*n'*), to the preceding noun, and by simple juxtaposition. In the Malayan languages the genitive case is often expressed by juxtaposition of the two nouns, very frequently also it is denoted by the use of the word *na*, or some form of it inserted between the two nouns. In Polynesian languages the words, *na*, *no*, are used in the same manner, the *n* of these words are frequently dropped, and then only *a* or *o* is used. In the Melanesian languages, the

genitive is also formed by juxtaposition, and very frequently by the use of *ono, no,* or *ni,* which by the dropping of *n,* becomes *i, e* or *o. Ni* governs the genitive case in ten Melanesian languages, *na* occurs in 3, *ne* in 1, and the shortened forms *r, e, o,* in four others.

8. *Similar prefixes.*—A use of similar prefixes is shown to exist between Malagasy and several of the Malayo-Polynesian languages; thus, in Batak, *ha-darat*=to go ashore (said of a person bathing), and in Malagasy, *ha-tratra*=up to the breasts.

9. *Personal pronouns. First person singular and plural. Third person singular.*—The Malagasy first person singular *aho* =I, is the same as *aku* in Malay and probably the Polynesian *au.* In Malagasy there are two forms to express the first person plural; one includes the person or persons addressed, the other excludes, as, *isika*=we (and you); *izahai*=we (but not you). In all the Melanesian languages, there are two forms of the first person plural, which are used in exactly the same manner as in Malagasy. Some of the other pronouns show a probable relationship between Malagasy and Javanese, as *izy*=he, she, it, with Javanese *iä,* in fact, *iä* itself is used by the Vezo Sakalava to express the same pronoun. The Malagasy *izay*=who, may have been formed on the Fijian relative pronoun, *ai,* and the word *àno*=a certain one, used in Western Madagascar also appears again in the Javanese *àno.*

10. *Suffix pronouns. First person singular. Third person singular.*—Of the suffix pronouns the similarity between the forms used in the Melanesian languages and in Malagasy is very great. The Malagasy form is *-ko,* for the first person singular. In twenty-four or more of the Melanesian languages, some form of *-ko* is used to express the same word, as *-ku, -gu, -k, -qu, -g, -ke, -go.* The Hawaiian *-u* and the Tongan and Fijian *-ku* are the same as the Malagasy suffixes *-o* and *-ko*=of me. In the third person singular the Malagasy form is *-ny.* The letter *n,* is found in the same pronoun in thirty of the Melanesian tongues.

11. *Demonstratives.*—Of demonstrative pronouns, two in Malagasy take the same forms as Malayan demonstratives, but having the meaning reversed, as in Malagasy: *ito*=this, in Malay means, that, *ini* in Malagasy=that, and in Malay=this.

12. *Adjectives, Melanesian suffixes, prefixes.*—Malagasy adjectives are formed in the same manner as adjectives in the Melanesian languages, some by the use of suffixes, others with prefixes. In the Melanesian tongues many nouns are formed into adjectives by taking the suffixes *-a, -ga, -ha, -ra, -ina.* In Malagasy nouns are changed into adjectives by suffixing, *-ina, -ana, -ena,* as *fasika* = sand, makes *fasch-ina* = sandy; *bika* = shape, makes

bik-ana = well shaped, and *fery* = wounds, make *fer-ena* = having wounds. Malagasy adjectives are often formed by prefixing *ma-* to a root form, as *ma-dio* = clean, from root *dio*; *maloto* = dirty from *loto*, *m*-erika, showery, from *euka*. In the same manner adjectives are formed with the prefix *ma-* in sixteen of the Melanesian languages, and in all these the prefix *ma-* indicates condition as in Malagasy.

13. *Verbs. Common use of verbal particles. Prefixes without any separate meaning.*—The use of verbal prefixes in all the Polynesian and Melanesian as well as in some of the Meronesian languages implies a kind of affinity between them and the Malagasy tongue which employs verbal prefixes in the same manner, though they are not in the same form. There is also another point of resemblance in these prefixes, taken separately they have no meaning in themselves, in any of the above languages, but when employed as prefixes, they invest the words to which they are attached with the properties of a verb.

14. *Reciprocal prefixes.*—The reciprocal prefixes *vei* and *var* with their varying forms, *vua*, *hei*, *hai*, *fai*, *we* and *e*, are found in twenty-one Melanesian languages. In Malagasy also reciprocation is expressed in the same manner by the use of the form *-if-*.

15. *Conditional prefixes, ma-.*—Conditional prefixes are used in nearly all the Melanesian languages, *ma-*, *me-*, and *m* are met with in twenty languages, and in others *ta*, *t'*, and *da-*, are found: *ma-* is also used as a conditional prefix in Malagasy.

Tafa.—The prefixes, *tara*, *tav*, *ava*, *tapa*, &c., are employed in thirteen languages to denote spontaneity. The Malagasy equivalent of these is *tafa*. Dr. Codrington says,[1] "An example from Mota will explain its use; to untie a rope is to *ul* it, but a rope that has not been untied by anybody, but has come untied of itself = *me tavaul*. The same is the case when the prefix is not plied to a verb; *raka* in Mota is "up"; *tavaraka* is to get up, not to be raised, to get up of oneself. The resemblance between the Malagasy *tafa*, and the Banks islands *tava*, is so complete in form and signification, and this in a fine point of meaning, that, considering the space of ocean that separates the languages, it is a matter of astonishment that it should exist. It is impossible that it should be accidental, it could not be introduced by Malays or Polynesians who have it not; it must have survived no one can tell, what vicissitudes and changes, in a course of years no one can number, and presents itself, like a rare species of plant or flower in isolated and widely separated localities, a living and certain proof of common origin and kindred.

[1] "Ant. Ann.," iii, p. 351.

16. *Prepositions ny=of.*—The preposition *ni* = of, in Malay and Batak is the same as the preposition *ny-* in Malagasy.

Prepositions i and a.—The Malagasy preposition *i* = at or in, as *i-voho* = at the back, is probably the same as the Dairi and Hawaiian *i*, Malay and Batak *di*, and Mangkasar and Bugis *u*: and both *i* and *a*, as in *i-maso* = in the eyes of, and *a-morona* = on the brink of—closely resemble the forms used in twenty-four of the Melanesian languages. "The simple locatives *a*, *i*, and *e*, appear throughout the whole Melanesian area."

Prepositions amy, an.—The preposition *amy*, is represented in the Polynesian and Melanesian languages under a variety of forms, as *mi*, *me*, *ma*, *mo*, *imi*. These all agree in meaning with the Malagasy form, *amy*. The Malagasy preposition *an*, is recognised in the Melanesian *ana*, or *an*, which has the same meaning.

17. *Reduplication.*—The reduplication of a root in the Malagasy language generally indicates a repetition or plurality of the idea contained in the root, in other cases it points to doubt or diminution, or implies reservation. It is also used in forming comparatives.

Malayan.—Reduplication of both verbs and nouns is found to be of more or less frequent occurrence in all the Malayan group of languages. It is generally employed in a frequentative sense, but it is also used to form collectives, in which it also points to plurality and repetition, as the leading idea. Besides the above, reduplication is also used in Malayan tongues to form diminutives.

Polynesian.—In the Polynesian languages reduplication is used to form frequentatives and collectives, and to express plurality. It is also employed as in Malagasy in forming comparatives.

Melanesian.—The use of reduplication occurs in many of the Melanesian languages; it is generally used as a frequentative, but sometimes in a different sense, as in Fiji, it is used as a diminutive or for derivation. In Eromanga, Tanna, Malikolo, and Bauro, it is employed as a means of derivation.

Summary.—In the above we have a considerable amount of evidence (and much more might be collected) all pointing to one conclusion, viz., that Malagasy is a member of the same group of languages as those spoken by the Malays, and in the islands of the Polynesian, Melanesian, and Mieronesian Archipelagos.

In brief this evidence consists of—1, similar forms for numerals; 2, the use of the same words to express every-day actions and the ordinary things of daily life; 3, the joining together of words by the use of the letter *n*; 4, by the same

use of infixes; 5, the same definite article; 6, the same personal article; 7, the same manner of expressing the genitive case; 8, similar prefixes; 9, similar personal pronouns; 10, similar suffix pronouns; 11, and demonstratives; 12, the same manner of forming adjectives; 13, a similar use of verbal prefixes; 14, and reciprocal prefixes; 15, also conditional prefixes; 16, the use of the preposition *ny*=of; 17, and a similar use of reduplication of roots.

Other points worthy of investigation.—There are many other points connected with this subject well worthy of investigation as—1. The question of the non-introduction of Muhamedanism into Madagascar by the Arabs, though they instructed the natives in their system of astrology and divination. This seems to imply that the first immigration of Arabs on the south-east coast took place either before the time of Muhamed or very shortly after, in fact before Arabia and the surrounding countries had accepted that religion. 2. The improbability of Africans having first inhabited Madagascar, from the fact that the pure African races of Eastern Africa are not sea-faring people, nor have they any sea-going craft. Whatever there is of a sea-going element on the east coast of Africa, it has been introduced by Arabs and other outside nations. 3. The comparison of Malagasy with the Malayan and other languages, seems to imply that the primary immigrations to Madagascar from the East must have been at a very early date, and probably before the Eastern race or races had spread themselves over the extensive and numerous islands of the Eastern Archipelagos, and also before the Arabs were acquainted with East Africa, if we are to consider the commencement of the Christian era as the date of their first acquaintance with the East African coast. There are many other kindred points on this subject which are well worthy of investigation, and would probably tend to throw much light on the hidden history of a most interesting people and country.

Salutations.—The salutations in use amongst the various Malagasy tribes differ somewhat, in form and idea, but not so much perhaps, as might be expected, when we consider the varying circumstances of each tribe. The forms in use amongst the Hovas are more full, and more expressive of politeness than those of the other tribes. This was to be expected, seeing that the Hovas, in their use of words and in their manners they are the most polite of all the Malagasy people. The common Hova form of salutation is—

Hova. Manao ahoana hianao?—How are you?

Resp. Tsara hiany aho-fa misotra anao.—I am very well, I thank you.

A salutation to a Hova person of importance is as follows:—

Tsaràve, tompoko. E. !
Veloma, soàva tsarà.—Good-bye, may you be good and excellent.

Sakalava, North. Akory anareo ?—How are you ? } used amongst
Resp. Maiva, akery anareo ?—Well, how are you ? } men.
" " Akory anao, sakaiza ?—How are you, friend ? { used with
Resp. Tsara-bè, akory anao ?—Very well, how are you ? { women.
" *South.* Salama aminao, akory anao ?—Peace with you, how are you ?
Resp. Bosoa, akory anao ?—Very well, how are you ?
Mahafaly. Salama.—Peace.
Resp. Salama.—Peace.
Antanosy. Akory anareo atu ?—How are you there ? } at meeting.
Resp. Ahy, Izahay atu.—Yes, we are here. }
" Eë aminareo eë !—We leave you well and safe, eh ? } atparting.
Resp. Ekāā.—Yes, oh yes. }
" Salamanareo eë ?—We leave you in peace and safety, eh ?
Resp. Ekāā.—Yes, oh yes.
Betsileo. Filahitra anareo.—May you be happy.
Resp. Filahitra.—(And you also) happy.
Betsimisaraka. Finahitra anareo.—May you be happy. { used by men to women, and women to men.
Resp. Finahitra.—(And you also) happy.
Finahitra anao.—May you be happy. { Used by men to women.
Finahitra ny kisany.— { Used by women to women.

By a study and comparison of the forms of salutation in use in a country, it is evident that much may be learnt of the history, past and present, of the people.

The ease, grace, politeness, and respect shown in the salutations in use amongst the Hova tribe, points to a people enjoying a state of safety, ease and prosperity, also to a well established form of society having its respective grades. Amongst the Sakalavas North, we may imagine a state of simple independence and equality and mutual regard. Amongst the Southern Sakalavas, the elements of fear and doubt come in, Salama aminao—Is all well with you ? Is it peace ? Do you come in peace to me ? Are you at peace with others ? or, Have no doubt regarding myself, for I am at peace with you. All this points to a country in which intrigue and cunning is at work, an unsettled state of society. The Mahafali salutation is as abrupt as the people who use it. There is no beating about the bush with them. Is it peace or war ? Do you come as a friend or an enemy ? In the Antinosy salutation we may trace the signs of mutual interest mixed with a fear of dangers from outside. Are you still all right—no evil has happened to you ? or on leaving, You feel we are leaving you in a state of safety ? Such terms and ideas might well be exchanged by a people, whose country is surrounded by tribes ever ready to attack whenever

they see a favourable opportunity, and being amongst themselves broken up into a number of petty sub-tribes, each of which is ever on the alert to attack, kill, steal cattle, and carry off people as slaves. The form of salutation used by the Betsimisarakas and Betsileo points to a people who had been accustomed to dwell in a country blessed with comparative peace, and exemption from continuous raiding and fighting—a quiet, agricultural people rather than great cattle-keepers. The use of the second person singular in nearly all the provincial salutations point to the meagre measure of respect and regard accorded to the female sex. This is shown especially amongst the Sakalavas and southern tribes. Whilst the esteem and probably also fear, with which men are regarded by women is shown by their almost invariable use of the second person plural when they address any of the male sex.

It is quite likely, that at the present time, all these various salutations are simply used as a kind of formula, without any regard or interest in their real meaning whatever, rather as a kind of introduction to further conversation than anything else, but this does not detract from the value of the formulæ, nor is it a reason why they should not be regarded as a kind of depository of the history of past times, if not the present. Most of the past history of uncivilised tribes is lost through want of written records ; but yet how much still exists, hidden somewhat, in the old words, forms and phrases still in use ! How much would a careful study and examination of salutations, proverbs, conundrums, tales, legends, and traditions reveal of a nation's past history, the people's thoughts and habits of life, their condition, pleasures and troubles !

Conundrums, &c.—In every country a store of riddles, tales, legends, and such like lore, is to be met with, and Madagascar is not without its share. Often have I sat by the village or camp fire, as the case might be, whilst the men, and women also, if any present, squatted around enjoying the early hours of the evening, telling tales (fables) and putting conundrums. Several of these riddles and also some proverbs I collected whilst in the Antinosy and Sakalava country, of which I here append a few. The person proposing the riddle says "Takasiry," to which the people answer Ëë. The following are from the Antinosy people :—

1. Raha raiky miharo aminy angàrin' ny olo ? = Something mixed up with the name of the person. Answer : Vaha = a basket, or makinty = a kind of sweet potato, because Ivaha and Makinty are used as women's names.

2. Raandria omba andrano, olo menty omba tambo = The king goes by water—the black man goes on foot, or by land. The answer is Vary=rice,

and Varondra=sweet potatoes, because rice is generally conveyed by canoe, and sweet potatoes in baskets overland.

3. Zanari Raandria tsipatora andoha = The child of the king is not slapped on the head. The answer is Reketa—which is the Malagasy name for a species of Opuntia, a prickly pear. This is so full of thorns that no one would think of striking it with the hand.

4. Zanaka Raandria miampata ang'abo = The child of the king looks down from above. The answer is Akondro = bananas, because of the great head of bananas hanging down from the fruit-stalk, and seeming to look down on the ground.

5. Teano-bi, tsitafoa = a big house, not roofed in. Answer: Zoliky or Valonemby=the cattle yard, which is a large enclosure without any roof.

6. Raha hany, raha tsy hany = a thing to be eaten (and) a thing not to to be eaten. Answer: Sariky = a calf, and Fariky = a bee. A calf can be eaten, but not the bee. This is simply a play on the two words Sariky and Fariky, but it is not perfectly correct, for some large species of wild bees (or wasps), when in the larval state in the comb, are roasted and eaten.

7. Angiro Zanahary misy zano antroky = God's stick has water in its stomach. Answer: Fary = sugar-cane, because of the water or juice there is in it.

8. Raha kely kely mahay mitrambiky = a rather small thing that knows how to leap. Answer: Dinta = a leech, because of the leech seeming to leap from the ground or from the grass and fastening itself to the bare legs of the passers-by.

9. Dimylahy-misatroky bory = Five men (each) with a round hat, Answer: Tundu = The fingers: the finger-nails are the round hats.

10. Ny maty no mitanza ny velo ?=The dead which carries the living. Answer: Kibany = a bedstead. Because a framework like the top of a bedstead is used for conveying the dead on to the grave.

11. Maro ampinga, maro lefo, fa tsimahaleo miamby vady aman zanany. Answer: Tsuha = a lemon tree. Plenty of shields (and) plenty of spears, but (still) unable to guard his wife and children. The spears and shields refer to the thorns of the tree and the hard green rind of the fruit.

12. Mandevy, tsy lio = Buried but not rotting. Answer: Volo = hair; because it does not rot quickly in the ground.

13. Soa kily mahay mandary. Answer: Tantely = Honey.

14. Zanaka Raandria mikunga antana mishitsy angaitsy. Answer: Tsako = Indian corn.

15. Voa-sary masaka no tsy teo fasy, soa ampela no tsitia vadiny mahazo nazy. Answer: Laorangy = the fruit of the ampelo (orange).

16. Sandoko raiky latsaka anteng'a rano. The answer is Sambo = a ship.

17. Reny maty amboly aloky, zanany maty mang'orokolo. The answer is Vary = rice.

18. Tily ang'abo, tomboy tsimikwitsy. The answer is Varagashy = a door.

19. Ang'omby menty homa amcronky. Answer: Hao.

20. Raha ang'abo be volontratra. Answer: Fanza.

21. Bararata ifiririotsy—Mahafaly mangala deotsy.

22. Kirioky, kirioky, andakatsy.
Kamireoseo tsimangalatsy.

23. Tsimimisy antayley.
Raha talay tsimahay mitifitsy.

24. Tapa vy, tapa fiharatsy.
Tsy maty nino, maty alatsy.

25. Kiry fuly, mira fotany.
    Mihira mizaza, fa soa nytany.
26. Voatavo domiky, vava ao kepoky.
27. Be Fihiseng'a manday mikoty.
    Boka eo renylahy, mandeha mba foty.
28. Tripiriry petaky, tsimang'iry hetsaky.
29. Akata amcrondrano, tsihay ang'omby hany.

Many other examples might be added to the above. There are many also, though useful in throwing light on the mode of thought and customs of the people, are yet not suitable for publication.

Changes in words.—We will now turn our attention to some remarkable features in the Malagasy language, some of which are also common to the languages spoken in the Eastern Archipelagos.

Royal words.—It is interesting to notice the causes which lead to changes in the meanings of words and sometimes to their temporary or even total disuse. These changes are brought about in a variety of ways, but almost invariably in some connection with the king or head of the tribe. There are many words which are used in a certain sense to the king (or queen, if she is head of the tribe), and these words cannot be used in this special sense with the common people. Especially there are those which have reference to the state or health of the living king. In the following list separate words are given, denoting those used in connection with the sovereign, and those referring to the people, as when speaking of an ordinary person he is said to

Be *marary*	= sick,	but the king is	*mafanafana*	= warm.
„ *maty*	= dead,	„	„	*folaka*	= broken.
„ *fola-manta*	= sudden death,	„	„	*folaka andantony*	= broken of the forearm
„ *misaona*	= wailing,	„	„	*miaty dranomaso*	= to offer tears
„ *alevina*	= buried,	„	„	*afenina*	= hidden.

There are several other similar words. Numbers of the royal family when dead are said to be "diso"=missing, not "maty"=dead, or "lasa"=gone, or as some say "latsaka"=fallen. Amongst all the western and southern tribes the greatest respect is paid to the king or whatever appertains to him. It is sufficient to say "andonaka," to restrain any busybody from even touching anything belonging to the king, or coming from the king's residence, the "lonaka."

The word "biby."—The word "biby" is used in a rather curious manner amongst the Sakalavas of the north-west and west coast of Madagascar. The word is most probably the Swahili "bibi," meaning grandmother, lady or mistress (used by slaves), a name of honour. It is the custom amongst

some of the Sakalava queens to take for a husband a young man from the Swahili-Arab population. This young man receives the title of "biby," and is subject to certain rules similar to those which bind the wife of an influential Arab or Swahili. He is not supposed to go out of the house in the day-time, or to be seen by the people generally. When he goes out in the evening, or on a visit to another place, he is always accompanied by three or four female slaves, who keep about him in much the same manner as if they were waiting on a lady. Amongst other rules, he is bound to remain faithful to the queen; should he violate the marriage contract, the penalty is death. The queen of Katsepy, a Sakalava district opposite Majunga, is married in this manner, and has an Antalaotsy man for her "biby." I do not think this term is given to the queen's husband should he be a Sakalava, nor do I think the word is used in reference to any of the Sakalava chiefs and their wives, by the Sakalava, though the Swahili-Arab population would naturally apply the term to the wives of the Sakalava chiefs, or, in fact, to any woman whom they wished to please.

Words common to kings and chiefs only.—Besides special words which are the exclusive property of kings and queens, there are a number which are common to kings and chiefs, but cannot be used in the same manner by the other people, as in the following list of words used in the Antinosy country.

King's word.	People's word.	English.	King's word.	People's word.	English.
Mikama ..	*mihina*	to eat.	*Feensonga* ..	*oro*	nose.
Fanzàvitsy	*tangà* ..	hand.	*Fang'avoa* ..	*vava* ..	mouth.
Fandia ..	*tomboky*	leg.	*Fandrasa* ..	*nify* ..	teeth.
Kabesa ..	*loha* ..	head.	*Fameliky* ..	*lela* ..	tongue.
Fihena ..	*maso* ..	eyes.	*Ferang'a* ..	*tratra* ..	chest.
Fivavia ..	*lamosy* ..	back.	*Samaky* ..	*teraky* ..	a woman who has borne children.
Maroy ..	*volo* ..	hair.			
Tantaitsy ..	*vaoky* ..	beard.			
Mitandava	*mandeha*	go.	*Métambésatsy*	*mitubúka* ..	to leave.
Mirosy ..	*mandry*	sleep.	*Sabaka* ..	*satroky* ..	cap or hat.
Mahakama	*hany* ..	food.	*Mang'iálo* ..	*ampondra* ..	plate or dish.
Mang'oa ..	*mang'a-laka.*	to filch for eating.	*Fioky* ..	*sotro* ..	spoon.
			Lonaky ..	*trano* ..	house.
			Anza ..	*vintsy* ..	satisfied.
Misonsy ..	*mizaka*	to talk.	*Miandrano* ..	*miang'aitsy*	evacuate.
Mahena ..	*mahita* ..	to see.	*Mianky* ..	*maty* ..	dead.
Tsarembo ..	*lamba* ..	clothes.	*Fiang'itsy* ..	*fisofa* ..	bladder.
Menkahaky	*homehy*	laugh.	*Diso* ..	*lasa* ..	dead.

"*Fady*" *words and substitutes.*—Again the king has power to

make certain words "fady," viz., to prohibit their use, it may be for a time, or entirely, and then other words must be adopted to use in the place of the "fady" words. As, for instance, Tompomana, king of the South Sakalavas, had occasion to visit Manombo, one of his chief towns, on the west coast, in order to perform the ceremony of washing the "jiný" or relics of the departed kings. On this occasion he made a number of words "fady," amongst them were the following, which are given with their substitutes:—

Tsihaiko	now	*tsikasako* = I do not know.
Famaky	„	*tsyavia mang'oa and'onaky* = an axe.
Renaiky	„	*betiky* = a child.
Lehilahy	„	*dzaodzao* = a man.
Mahay	„	*mahakasa* = to know.
Balahazo	„	*madzèra* = cassava.
Koso	„	*fitsó* = a pig.
Tcheky	„	*besenta, tsibabaky* = a pumpkin.

Words containing part of the name of king or queen prohibited.—So again amongst the western and southern people of Madagascar, great changes are made in the use of words by the prohibition of the use of any word containing a part of the name of the king or queen. This custom has undoubtedly done much to produce the difference existing between neighbouring dialects, and its value in this connection may be estimated when we consider the number of petty kings there are, and that the name of each one produces a more or less permanent change in the language.

Change of name at death of kings, chiefs, and notable persons; change of name of living persons.—Again a considerable effect on the language is produced at the death of kings, chiefs and any person of importance or notable in any way—even if they are poor. The mention of the name of the king, which he bore whilst living, is tabooed to all the people of his kingdom. The name of a chief is tabooed to all in any way connected with him, and that of a notable person to all belonging to his or her family, and should there be another person in the family bearing the same name as that of the person deceased, that name must be laid aside and another one taken. This change of name is often made as a mark of respect for a friend, as in a case which happened at Nossy Vey, a woman named Nafiniko died, her friend, not of the same family, but bearing the same name, changed it for Ranza.

It is considered an honour to the dead to change their name. I was once travelling along the west coast in my "laka" when in the distance we heard some guns being fired off, denoting a death. Shortly afterwards, passing another "laka," my men made inquiries as to who was dead. It was the grown up daughter of

a certain person, but the people in the "laka" were careful not to mention her name. On asking the reason, I was informed that the name of the deceased person was to be changed, and they did not yet know what new name would be adopted for her. She was not a person of great family, but had won the esteem and regard of the principal people on account of her quiet demeanour and respectable manner of living, and on this account was to be honoured.

General use of the custom of changing words.—This custom of changing names and words seems to be common throughout Madagascar. It is everywhere in use along the west and southern districts of the island amongst the Sakalava, Mahafaly, Antandroi and Antanosy. The names given to the deceased kings and chiefs are invariably formed of three words, of which the first is always Andriana = lord, the second is some word denoting respect or honour, or pointing to some characteristic of the deceased; the third and last part of the name is always *arivo* = a thousand, as the name of Raimosa, a Sakalava king, was changed to Andria-mandion-arivo. Any mention of the name borne by a chief or king whilst living is strictly prohibited after the death of the said king or chief. The violation of this law is severely punished—and the offender may even have to pay the penalty with his life. Even amongst the common people it is considered highly indecorous to mention the name of a deceased person.

Writing and reading.—I must finish these notes by a few remarks on Malagasy writing, arithmetic and art.

The art of writing was first introduced into Madagascar by the Arabs, who at an early date came and settled on the south-east coast. It is highly probable that only the few, viz., those who had the keeping of the sacred writings, and who were expounders of the mysteries of sikily and vintana, were taught how to read and write. The fact of there being so few who understood how to read and write in the Arabic character, when the missionaries first came to Madagascar, implies that it could not have been commonly taught. At the present day there are still some few amongst the Antaimoro, Antanosy, and other south-east tribes who understand something of writing with Arabic letters. Those of the Antinosy who are acquainted with it, are either kings or great chiefs; none of the common people can either read or write. Besides the above, there are many amongst the Antalaotsi of the north-west coast and the Antalaotra of the south-east who are able, more or less, to read and write in the Arabic character. But these Antalaotsi of the north-west can scarcely be regarded as Malagasy, being the offspring of Swahili-Arab fathers with Malagasy women,

or else African slave women, and I think that the Antalaotra of the south-east have a somewhat similar though perhaps a rather more ancient origin. A knowledge and use of the Arabic characters is common to all the Swahili-Arabs throughout Madagascar—so one may reasonably expect their descendants to know something about it.

The Roman characters.—Since the arrival of missionaries, the introduction by them of the Roman letters has quite superseded the use of the Arabic characters amongst the Malagasy, the only real Malagasy still retaining a knowledge of Arabic letters being a few of the kings and chiefs of the south-east tribes. Writing and reading in the Roman character is fairly well understood by the Malagasy, at every permanent mission centre, or large Hova station. Apart from the instances given above, all the Malagasy tribes, the Hovas excepted, have no knowledge of reading and writing. Generally speaking all the extensive Sakalava and Bara tribes on the west and the Mahafaly, Antandroy, Antanosy, and others in the south, are quite unacquainted with the use of letters, or figures, as we employ them; the nearest approach they have to anything like writing is shown in their habit of cutting notches in sticks or tying knots in pieces of string. Whilst at Manansua in South Central Madagascar I employed several men for a number of days to fetch material for building a new house. When the time came to pay them for their work, each man brought a piece of string, in which he had tied a series of knots denoting the number of days he had worked. At another time I employed an Antinosy man as foreman over a number of natives digging for fossils. This Antinosy could not write, so he cut some short sticks, according to the number of men working, and considering each stick to represent a certain man, he, every evening, when the day's work was over, made a notch in each man's representative stick. By this means he was able to give me a correct account of the number of days' work done by each man.

Wood carving and Pottery.—The art of decorating and carving is practised more or less throughout Madagascar. The Betsileo seem to be more elaborate in their designs and productions than any other of the Malagasy tribes: this is shown especially by their carved house posts, and numerous memorial posts. There are also some very elaborate pieces of work to be seen amongst the South Sakalavas, and in the Manansua district of the Antinosy. This carved work in the south and west is always used in some connection with the dead, either as memorial pillars, or else it takes the shape of an ornamental and decorated fence around the grave. The memorial pillars

amongst the Antinosy are carved in a variety of forms, sometimes full sized figures of men and women are set up on pedestals some 4 or 5 feet high. In other cases the memorial takes the shape of an obelisk placed on a pedestal some 5 or 6 feet high, on which a number of birds, and symbolical animals, as the crocodile or cattle are carved, and invariably a wooden bird is placed on the top of the obelisk. A great number and variety of these are found in the Antinosy country in South Central Madagascar. An idea of primitive carving is shown everywhere in Madagascar, by the peculiar devices and ornamentations given to their wooden spoons, and the elaborate zigzag and other patterns worked on their earthen cooking and water pots. Sticks also and pieces of bamboo, serving as snuff boxes, are often covered with zigzag patterns and outline sketches of men, birds, crocodiles and other things. This kind of ornamentation also comes into their weaving and cloth-making operations. I have a fine cloth made by Timpy, the wife of King Befanatriki, in the borders of which both cattle and crocodiles are represented.

Discussion.

Colonel Maude said he had listened with great interest to the paper, which had been carefully prepared. He pointed out that no one who had been in the country doubted for a moment that the Hovas were of Malayan origin; the type of their features, as well as their language, conclusively established it. The wonder and marvel are how they came there, probably not over two hundred years ago; with a certain proportion of women too. The prevailing wind, however, for ten months in the year is easterly, proved by the enormous quantity of pumice stone, much of it covered with bivalves, which had attached themselves to it *en route*, cast up on the Eastern Coast of Madagascar, which began to arrive within about three months of the eruption of Krakatoa, and which still covers the eastern coast. (The exact sound of the word Malagasy is Mălăgāssy: the usual abbreviation being 'Gash; the French call them Malgāche.) While Colonel Maude was in Madagascar, about three years ago, a Hova died who perfectly remembered the first King of Mérina, Andrian-ampoiniemerina, which fact also points to the recent date at which the Hovas established themselves as the ruling race of Madagascar.

NOTES *on a* COLLECTION *of* CRANIA *of* ESQUIMAUX, *exhibited by* Prof. A. MACALISTER, F.R.S. By W. L. H. DUCKWORTH, B.A., Fellow of Jesus College, Cambridge.

THE Cambridge collection has been enriched by six skulls, and a complete skeleton, of Esquimaux from Labrador, presented by E. Curwen, Esq., M.D., St. John's Coll., Cambridge. The accompanying table gives their principal measurements and indices, which depart in no very important points from those already recorded by other observers. With these are arranged similar figures relating to the other crania of Esquimaux in the University Museum. It may be added that the ten specimens as a series are characterised by (*a*) the small size of the nasal bones, (*b*) the form of the Foramen Magnum, which is long and in some cases almost pyriform, a backward prolongation encroaching on the squamous part of the occipital bone, (*c*) the tendency to reduplication of the infra-orbital foramina with persistent infra-orbital sutures.

As individuals, the following notes deal in the briefest way with features of interest:—

Catalogue No. 1832. Inscribed "Eskimo, Davis Straits, Dr. Skae." This is a very large adult male skull with prominent cheek bones; foramen magnum very large; mandible wide with everted angles. The sphenoidal spines are of unusual size, and the remaining teeth well worn.

No. 1833. Skull of Eskimo, Holsteinborg, S. Greenland. Probably an adult female. The foramen magnum is of considerable size, with postcondylar foramina. The mandible is wide, and the sigmoid notch very shallow.

No. 1834. Skull of Esquimaux, Greenland, Macartney collection. This is the skull of an adult male; the facial parts are flat, but the nasal spine is long and sharp. The palate is of considerable width, the foramen magnum very long, the foramina ovalia are placed rather more externally to the pterygoid plates than usual.

No. 1867. Skull of Eskimo, from S. Greenland, purchased (from the Lowestoft Museum). The skull of an aged male, with edentulous upper jaw. The roof of the cranium can be removed, and thus the cephalic index can be calculated from measurements on the interior of the brain-case which more nearly represent the dimensions of the cerebrum. The internal measurements give a cephalic index of 74·3; the external 71·9.

No. 1868. Skull from Port Hope, Ailek, Labrador, presented by E. Curwen, Esq., M.D. This is a large and heavy male skull with massive jaw; the nasal bones are remarkably diminutive; the sphenoidal spines large; the foramen magnum long and oval.

No. 1869. Eskimo from Blackhead, Hopedale, Labrador, presented by E. Curwen, Esq., M.D. From a grave with bronze ornaments. This is an immensely long and rather high skull the facial bones have been in great part lost

DIMENSIONS OF SKULLS OF ESQUIMAUX.

Measurements.										
Catalogue No. of Skull.	1833	1834	1867	1832	1868	1869	1870	1871	1872	1873
Age and Sex.	Adult ♂	Adult ♂	Aged ♂	Adult ♂	Adult ♂	Adult ♂	Adult ♂	Adult ♂	Adult ♀	Adult ♀
Cubic capacity	1385	1340	1550	1790	1480	—	—	—	1420	1225
Maximum length	183	178	192 (171)	198	183	202	171(?)	181(?)	181	180
Maximum breadth	130	130	138 (127)	142	138	133	128(?)	130	133	128
Basi-bregmatic height	128	135	136	141	145	140	—	139	139	129
Basi-alveolar length	94	97	—	101	104	—	—	—	98	91
Basi-nasal length	94	101	106	101	101	107	—	—	106	97
Orbital height	35	34	33	37	36	38	—	—	37	36
Orbital breadth	39	39	42	42	39	43	—	—	41	38
Nasal height	50	53	54	53	48	—	—	—	57	50
Nasal width	21	25	27	24	24	—	—	—	23	22
Cephalic index	71	73	71·9 (74·3)	71·7	75·4	65·8	74·9 (?)	71·8 (?)	73·5	71·1
Vertical index	69·9	75·8	70·8	71·2	79·2	69·3	—	76·8(?)	76·8	71·7
Alveolar index	100	96	—	100	103	—	—	—	92·5	93·8
Orbital index	89·7	87·2	78·6	88·1	92·3	88·4	—	—	90·2	94·7
Nasal index	42	47·2	50	45·3	50	—	—	—	40·3	44
Palato-maxillary index	114	105·6	—	120	105·3	—	—	—	115·9	—
Facial (Köllman) index ..	55·1	52·2	(?)	49·3	52·2	—	—	—	62·3	55·1
Stephano-zygomatic index ..	85·4	74·6	78·7	74·3	91·5(?)	76·1	—	—	86·15	81·1
Gonio-zygomatic index	89	—	77·9	72·3	83·5	79·6	—	—	77·7	83·5
Naso-malar index	105·3	106·2	113·6	106·7	106·1	—	—	—	108	108·6
Horizontal circumference ..	507	499	540 (?)	539	519	550	476 (?)	500 (?)	510	495

No. 1870. Eskimo skull from Hopedale, Labrador, presented by E. Curwen, Esq., M.D. A long and high skull.

No. 1871. Eskimo skull from Cape Ailek, Labrador, presented by E. Curwen, Esq., M.D. Foramen magnum very large; mandible massive with large teeth.

The three immediately preceding specimens have suffered so much from weathering that few remarks can be made with regard to them. The cranial portions seem to present the typical appearances.

No. 1872. Skull of Eskimo female, Cape Ailek, Labrador, presented by E. Curwen, Esq., M.D. A large massive skull with flattened facial bones.

No. 1873. Female skeleton from Labrador, presented by E. Curwen, Esq., M.D. The skull is small and the foramen magnum of remarkable shape, the nasal bones small, the sphenoidal spines long and sharp. The skeleton measures 1407 mm. in height; and the pelvis seems remarkably large in both transverse and conjugate diameter.

ANTHROPOLOGICAL MISCELLANEA AND NEW BOOKS.

Photography for Anthropologists.

My only excuse for troubling the Anthropological Institute with this paper is, that I am a practical anthropological photographer of some experience, who has worked in, for that art, most trying climates; and, having experimented with nearly all the first class cameras, plates, and apparatus in the market, has found out what articles are necessary, and what makers can be relied on.

I work for the Ethnographic Department of the British Museum, and ventured in a communication with Mr. C. H. Read, who besides being one of my scientific chiefs, is also on the Council of the Anthropological Institute, and joint editor of "Notes and Queries on Anthropology," to point out that Chapter LXVII in that book did not seem to me to answer all the questions which an explorer who intended to photograph for anthropological purposes would be likely to ask. It appeared to me to be written from the point of view of a past master, who, knowing the subject himself, cannot understand how anyone else can be ignorant of it. The ignorant people, however, are on the whole in the majority, and it is for them that I write.

I do not propose to teach the explorer how to take photographs. He can easily learn that in any town, and certainly in London, where, not to mention other firms, lessons are given by the London Stereoscopic Company, and also, I believe, at the Polytechnic Institution. The mere taking of a negative, and the printing of the same on cold bath platinotype paper, are easily learnt, and this knowledge is assumed by me. The ordinary information in photographic handbooks is of very little use to the class of photographer for whom I am writing. These handbooks are written, either in the interests of some firm whose materials may be utterly unsuited to the climate in which our work has to be done, or they give a long list of apparatus, plates, developers, and printing processes, from which the anthropologist can choose, but no advice as to what will or will not do in extreme climates.

Also, I do not believe that the explorer will get much good by consulting trade journals, or leading firms. Special goods are chanted, and bewildering and contradictory statements made, by rival firms, whose first business it is to sell their own goods, nor have many photographers or tradesmen in England the

experience in extreme climates or in the class of work required by anthropologists, which would alone entitle them to advise.

Now, as regards the importance of photography to the anthropologist, particularly when the work is carefully done, there cannot be two opinions. Mr. Read in the publication above referred to says, "The best plan seems to be to devote as much time as possible to the photographic camera, or to making careful drawings. By these means the traveller is dealing with facts about which there can be no question, and the record thus obtained may be elucidated by subsequent inquirers on the same spot, while the timid answers of natives to questions propounded through the medium of a native interpreter can be but rarely relied upon, and are more apt to produce confusion than to be of benefit to comparative anthropology."

I write for the information of would-be explorers, or recorders of ethnographic facts, and not for already skilled workers, though I propose relating details of my own procedure which may even be of use to the latter.

Properly taken photographs, with the additional explanatory letter-press, will be found the most satisfactory answers to most of the questions in "Notes and Queries on Anthropology." In Part I of that work, external characters could be illustrated, and large photographs of the face, in full face and profile, should be taken.

In posing the subject for these, the body must be upright, and the face so held that the eyes looking straight before the subject are fixed on an object on a level with them. (Exactly as fixed for measurement in Plate II.)

Chapter No. VII in this part can be illustrated by photographs, as also No. XVIII, the attitudes and movements being taken to the best advantage with a hand camera.

Chapter XXI, physiognomy, can also be illustrated by photography, and development can be shown by photographs taken of subjects at different ages. These should be stark naked, a full face and a profile view should be taken of each, and the subject should touch a background painted in black and white chequers, each exactly 2 inches square. All abnormalities, or deformations, whether natural or intentional, should be photographed; and in VII, medicine, and VIII, surgery, operations, bandages, &c., can be thus shown.

In Part II photography will be found of the greatest use in answering the questions accurately. The manufacture of different implements, weapons, &c. (each stage from the rough material to the finished article being shown), indeed almost every act of the life of a primitive people may be photographed.

With regard to the photographing of savage races the following hints may be of use.

It is absolutely necessary to have patience with the sitters, and to be in no hurry. If a subject is a bad sitter, and you are not using a hand camera, send him away and get another, but never

lose your temper, and never show a savage that you think he is stupid, or, on the other hand, allow him to think that, by playing the fool, he can annoy you, put off your work, or that to stop him you will be willing to bribe him into silence.

Before you pose a group of savages, have the camera (except of course in hand camera work) fixed up, and focussed for the spot where they are to stand. This can easily be done by marking a space on the ground within which they will be placed, and focussing sharply on some pieces of wood or stone placed in it. The dark slide should be in its place and all ready, so that as soon as the subjects are posed satisfactorily, the cap can be taken off the lens and the exposure made.

For ethnology, accuracy is what is required. Delicate lighting and picturesque photography are not wanted; all you have to see to is, that the general lighting is correct, and that no awkward placing of weapons or limbs hide important objects. This can easily be ascertained by the use of a small finder on the camera.

In any sitting group, where you are anxious to show the way in which the hands or feet are used in the manufacture of any articles, the camera can be made to look down on the objects, the swing back being used to focus with.

For want of the knowledge of better examples may I refer the intending photographer to my illustrated "Record of the Andamanese," executed for the British Museum, and partly finished. He will see the lines on which I work and will, no doubt, go and do better.

Before proceeding to practical details I will give one other quotation from Mr. Read, which, as sixteen years' experience with savages has taught me, contains one of the most valuable hints in the book "Savages will be found to answer more freely when the interrogator places himself on the same level as themselves, *i.e.*, if they sit upon the ground he should do the same."

The first question the intending photographer has to ask himself, before purchasing his outfit of photographic apparatus, &c., is: what sized negative shall I take? and before answering this he must consider the following additional questions:—

Where is he going?

What is the nature of the climate there?

Will he be stationary, or a traveller, when in the country?

What sort of accommodation does he expect to have?

In what grade of civilisation and friendliness are the people he is going to study?

Can he, when among them, easily procure fresh supplies from a well furnished depôt?

Lastly, how much money does he intend to spend?

As Regards Climates.

Extremes of heat and cold, by themselves, do not seem to affect good photographic apparatus much. In the former case it will be

necessary to use methylated spirit in the developer, or to ice the solutions, to prevent frilling; and in the latter, all solutions and the washing water should be warmed to about 70° F. In both cases all metal work should be covered with Russia leather in order that the fingers may not be blistered.

What one has to look out for, are, the extremes of dryness and damp, accompanied by either heat or cold, and of these two, after a long experience of the latter, I am inclined to think that the former is the worst.

Perhaps the best outfit for a very dry, hot climate would be that detailed below as the 5-inch by 4-inch outfit, with the addition that all the woodwork is replaced by metal, and that all the metal, including the lens mount, is covered with Russia leather.

The double backs should be of the solid, or American, not of the "book" form, and should also be, if possible, of metal. Messrs. Marion and Co. have a metal camera which should do.

If my instructions are carefully followed the damage caused by excessive damp can to a certain extent be guarded against.

A traveller will of course take a smaller outfit than a person who is stationary; and the accommodation the stationary person will meet with will influence him regarding the setting up of a studio and the working of anything larger than whole plate ($3\frac{1}{4}$ inches by $6\frac{1}{2}$ inches.)

If fresh supplies of photographic materials can easily be procured the original stock of plates and chemicals need not be very large, and the photographer can indulge in such things as isochromatic plates and films.

In parenthesis, I would remark that, while I am not connected with any particular firm, or anxious to advertise that firm's goods, it is necessary for me, for the purpose of this article, to state the makers from whom I advise the reader to buy his outfit, my sole reasons for giving these makers names being, that I have bought goods from them, and know from practical experience that these goods will do all that I say they will. I have therefore only mentioned the following firms:—

Messrs. Ross and Co., Dallmeyer and Co., Watson, Newton and Co., The London Stereoscopic Company, Marion and Co., Wratten and Wainwright, and Mr. P. Meagher.

Messrs. Newton and Co., of 3, Fleet Street, will manufacture almost any scientific apparatus which may be ordered, and their work is excellent.

I will now describe the different outfits I recommend for fixed cameras, commencing with the smallest, and leaving hand cameras till later. The additional articles required for all outfits will be mentioned hereafter, the present details being of cameras, lenses, &c., only.

Outfit No. 1.

A square, 5-inch by 5-inch, camera, of mahogany brass bound, with Russia leather bellows. Double extension. It should have

a double swing back, and rising and shifting fronts, to take a 5-inch by 4-inch plate either way. Six brass bound double backs are required, and two lenses, one Ross' 8-inch by 5-inch Rapid Symmetrical, and one Dallmeyer's No. 1A Wide Angle Rectilinear Lens. One drop shutter for rapid work. One stout tripod stand, and metal tripod head. One focussing glass. One pocket level.

A focussing cloth, 5 feet square. The camera, double backs, lenses, &c., will be in a solid leather case, lined with baize, which should have a lock, and the whole should have a stout waterproof cover.

With the above, excellent work can be done. By stopping the lens down to F/64, negatives can be taken which will stand enlarging to 15 inches by 12 inches, and in this way very good life-sized portrait heads can be done.

(It will be seen that I recommend throughout the employment of lenses a size or two larger than the size advertised to cover the plate used. The reasons for this are obvious.)

Outfit No. 2.

Stereoscopic work is well suited for anthropological studies, as in the stereoscope small details will be noticed which would be overlooked in an ordinary print. The following is therefore recommended.

1. 8-inch by 5-inch camera with double extension, &c., having three movable fronts, and a movable partition down the centre which will be inserted when stereoscopic work is undertaken. On one front should be two of Ross' 8-inch by 5-inch Rapid Symmetrical lenses, accurately paired. On another front should be a Ross' 10-inch by 8-inch Rapid Symmetrical Lens, and on the third a Dallmeyer's Wide Angle Rectilinear Lens No 1. The six double backs, tripod stand, case, &c., will be needed as in the previous outfit.

An advantage in this camera is, that either half of a stereoscopic view can be used as an ordinary 5-inch by 4-inch plate, for printing magic lantern slides direct, or for enlarging.

Note.—Always stop your lens down when taking stereoscopic slides, and give the plate a very full exposure. The camera must be accurately levelled.

For persons who are likely to move about much the following is perhaps the largest size which can be taken with comfort.

Outfit No. 3.

A square, whole plate camera, double Extension, fitted with Ross' 10-inch by 8-inch Rapid Symmetrical Lens, and with Dallmeyer's No. 1 Wide Angle Rectilinear Lens; also with six double backs, and all the additional articles mentioned in Outfit No. 1, which should be accepted as the guide for the sort of camera to be bought.

With this a smaller camera will be found more useful and practical than having loose carriers for smaller plates in the double

backs of the large camera, and I should advise the addition of the camera, &c., in No. 1 Outfit.

Note.—With such an outfit much very useful work can be done.

Outfit No. 4.

This would only be purchased by those who were likely to be stationary for a long time in one place, with easy access to the savages, and with a studio, &c.

15-inch by 12-inch square, double extension camera, fitted with Ross' 18-inch by 16-inch Rapid Symmetrical Lens, and with Dallmeyer's 18-inch by 16-inch Wide Angle Rectilinear Lens. Also, with six double backs in a separate case, a large tripod stand, and a studio stand.

With this, Outfit No. 2 should also be bought, and a hand camera would certainly be used.

For the guidance of purchasers I would state that I have all the cameras mentioned, besides others, and find a use for each. My cameras are square, double extension, by P. Meagher, and my lenses are, as mentioned above. Goerz's Double Anastigmatic Lens, Series III, will also be found most useful in scientific work.

Note.—Either Iris diaphragms should be used with the lenses, or the Waterhouse diaphragms should be pinned together.

The stereoscopic negatives, after one print in platinotype has been taken from them for record, should be sent to England to some firm of specialists, such as Mr. Chadwick, or the London Stereoscopic Co., in order that the transparencies can be prepared from them.

Lantern slides, perhaps the best form for examining small photographs, are also best made by some such firm, as the explorer will doubtless wish to spend his time in recording anthropological facts, and not in the operations of photography.

Square cameras with double swing backs, and rising and shifting fronts are the best; large tripod heads, and stout, long, tripod legs, are advisable. These legs are best made in one piece, and sliding legs should never be used.

With each of the above outfits, the following articles must be procured:—

Plates.—For ordinary work the best plates I know of are Messrs. Wratten and Wainwright's "Instantaneous" brand, and for very rapid work, the same firm's "Drop Shutter Special." Each dozen of plates should be separately sealed up in tin, and they will thus keep good for years, if stored in a dry place. A gross is a good number to take, if further supplies can be sent for.

If within easy communication of England, Edwards' Isochromatic plates are first class, and give special results which can be got with no other plate, but they will not keep well.

Films will not do.

(For lantern slides, or transparencies, if they are to be made in the field, which I do not advise, Marion's Chloro-Bromide plates are the best, and should be developed with the old Iron-Oxalate Developer.)

Varnish for Negatives.—Wratten and Wainwright's Crystal Varnish is good, as it can be applied cold. It is merely used as a protective, and can be removed, and a stronger varnish permanently applied, in England. A pneumatic plate holder will be wanted.

Printing Paper.—The Platinotype Company's Cold Bath Paper is the best, being simple in its working, and permanent. It keeps, as sent out by the Company, for a year, if the tins are unopened. A tin should not contain more than twenty-four pieces, and the operator should so arrange his work as to print off the entire contents of a tin in one day.

Focussing Cloths.—These should be, for the small cameras, 5 feet square, and for the large, 6 feet square; they should be of velvet, lined with yellow or red material, and in addition to a box of safety pins which should always be carried, half a dozen safety pins should be kept stuck in the cloth in order to fasten it round the lens, the legs of the stand, &c. The camera must always be entirely covered by the cloth, and it is not a bad plan to have two cloths for each camera.

A good *focussing glass*, as kept by any good firm, is required, and should always be used as our object is to get great and accurate detail, not to make pictures. "Fuzzygraphs" are quite out of place in anthropological work.

The *lens caps* must always be secured by a piece of cord (silk fishing line), to the lens mount.

The *screw* must be secured to the tripod head by a chain, and this head must be covered with leather or felt (sewn, not glued, on).

Use brass for all metal work, and avoid aluminium.

A good shutter will be required for instantaneous work. The Wollaston, Bausch and Lomb, Thornton-Pickard, and common metal drop shutter, are the best. The India-rubber bulbs and tubing for releasing the shutter pneumatically are useless, and the release should be given by a metal trigger.

Glass measures of assorted sizes are required. Say, one 40 oz.; two 20 oz.; two 8 oz.; and two 1 oz., divided into minims.

Two ebonite stirring rods should be taken.

French chalk, as a lubricant for woodwork, and vaseline for metal, must be carried. Dry curd soap is also a good lubricant for woodwork.

All apparatus should be in waterproof cases.

A couple of Winsor and Newton's Sketching Umbrellas will be found most useful, one to shade the camera, and the other to shade the subject.

They can be fastened into the ground.

The camera and the case of double backs should always be shaded by an umbrella when working in the open.

Each double back should be kept in a separate, numbered, silk or velvet bag. It should only be taken out of this bag, when under the focussing cloth, and, after exposure, should be replaced in the bag under the cloth.

Each lens should be kept in a locked leather box, lined with velvet.

Chamois leather should never be used as a lining for anything.

It is cheapest in the end to purchase the best things. All woodwork should be of mahogany; all leather, Russia. No iron, or metal that will rust, should be used. Weight is of no consequence. Strength is.

Camera level.—Good ones are supplied by all dealers.

A *good dark tent* is required. Both Meagher, and Wratten and Wainwright, supply these. Get the largest you can carry.

A couple of 5-inch, flat, camel's hair brushes are required for dusting the dark slides and plates.

Good handbooks on photography are: "Burton's Photography," "The London Stereoscopic Company's A.B.C. of Photography," Hepworth's "Photography for Amateurs," Wall's "Dictionary of Photography," and Ewing's "Photography for Amateurs in India."

Dishes.—The best dishes are of ebonite or *papier maché*, and no glass or crockery should be used.

Six dishes of the former material are required, which should be so sized as to pack one within the other in a nest, the smallest dish in the nest being of the largest size actually required for the work.

Six large *papier maché* dishes will be found very useful for the developing and clearing solutions used in platinotype printing.

A washing tray for the negatives, and another for the prints will be required. There are plenty in the market, and any strong, simple one can be chosen. Do not buy one to be used only with a tap or running water. Tylar's Metal Folding Washing and Drying Racks are convenient, and can be used with a bucket of water.

Note.—Do not attempt to wash negatives or prints in streams, and see that your washing water is free from grit.

Wash each plate well after developing, and after fixing when five minutes washing should be given to each plate separately. The backs of the negatives can be cleaned, while wet, with a tooth brush.

Printing Frames.—Six will be sufficient. All dealers keep good makes of these.

Chemicals.—Both for portability, good keeping, and other qualities, I advise a certain developer and fixing bath, as follows:—

Developer.

A.	Sulphite of soda	6 oz.
	Hot water	10 oz.
	Sulphuric acid (pure)	1 drachm.
	Pyrogallol	1 oz.

(Dissolve the sulphite of soda in the hot water, add the sulphuric acid, and pour the whole into a bottle containing an ounce of pyrogallol. Keep the solution in a blue glass, stoppered, bottle.)

B.	Anhydrous monocarbonate of soda ..	3 oz.
	Ferrocyanide of potash	6 oz.
	(Yellow prussiate.)	
	Hot water	20 oz.
C.	Potassium bromide	1 oz.
	Water	6 oz.

(A portion of this can be conveniently kept in a dropping bottle.)

To develop a whole plate take—

3 drachms of A.
6 drachms of B.
20 minims of C., and make up to 6 ounces with water.

If the temperature is very high add 1 oz. of spirits of wine to the above, to prevent frilling.

Use boiled and filtered water for the solutions.

Just flush your plate with water before developing, in order that the developer may flow evenly.

Do not touch the gelatine surface of the plate with sweaty or oily hands, but handle the plate by the edges only. Take care that no perspiration drops on the plate in the dark room manipulations.

Keep a stick of paraffin wax in the dark room, and rub it round the edge of the plate just before developing. This often prevents frilling.

Fixing Bath.

Hyposulphite of soda	16 oz.
Sulphite of soda	2 oz.
Sulphuric acid	1 drachm.
Chrome alum	4 drachms.
Hot water	64 oz.

Dissolve the sulphite of soda in sixteen ounces of water, and add the sulphuric acid. Dissolve the chrome alum in eight ounces of water.

Dissolve the hyposulphite of soda in the remaining water. Add the sulphite solution to the hyposulphite, and then add the chrome alum solution.

The plate should be allowed twenty minutes in this bath, and should then be well washed. I occasionally rock my fixing bath, when plates are in it.

A short washing in tepid running water is better than a long soaking in cold water.

The above bath will keep for months.

The Chemicals you will require, therefore, will be, for a small outfit, about :—

Pyrogallol	16 oz.
Sulphite of soda	12 lb.
Sulphuric acid	16 oz.

Potassium ferrocyanide	6 lb.
Anhydrous monocarbonate of soda..	4 lb.
Potassium bromide	1 lb.
Hyposulphite of soda	16 lb.
Chrome alum	2 lb.
Hydrochloric acid	6 lb.
Platinotype developing salts ..	6 lb.
Crystal varnish	12 bottles.

A dozen tins of cold bath platinotype paper, each tin containing two dozen pieces might be taken.

In addition to the above-mentioned cameras, for such purposes as recording the altitudes and movements of savages, and certain ceremonial and other details, a hand camera will be necessary.

There are several of these in the market, and very few of them would be of any use to an anthropologist. After much experience with them I can only recommend the following :—

Ross' 5-inch by 4-inch Portable Divided Camera, with Wollaston shutter. (This can be used as either a hand or stand camera, is a very good article, and can be considered an outfit by itself. It has double backs, and six of these should be bought. Do not use a changing box.)

The "Twin Lens Ideal" is a good camera, and so is the "Twin Lens Artist's," but perhaps the most suitable is the London Stereoscopic Company's No. 2 Binocular Camera, with eighteen plates and Zeiss Lens.

Instantaneous hand camera work is never as good as stand camera work, except perhaps in the hands of specialists.

In the above, and indeed in all cameras, care should be taken that the lenses, and all parts of the apparatus, are easily accessible for cleaning and petty repairs.

A Developing Lamp will be required if work is being done at night in an ordinary room, and any of the firms I have mentioned will supply a good one There are some very good dark room candle lamps in the market, which might be bought if you are going where kerosine oil is not procurable, and candles can be carried. In case the glass breaks, take some spare golden and ruby tissue.

Have as much *safe* light as is possible. Rock the negative during development, and cover the developing tray with a lid of blackened tin or wood.

A Bottle of Dead Black for re-blacking the interior of lens mounts, and the woodwork of cameras and double backs, is useful; as is also some enamel paint or varnish for repairing *papier maché* trays.

(A pin-hole in the bellows can be mended with a little fluff or lint attached by some dead black.)

A walking-stick, or the bough of a tree, is a good thing to rest a hand camera against to steady it. Very good clamps are sold with which to fasten hand cameras to trees or posts.

Cleaning.—This is an important item.

Lenses should be unscrewed every week, and lightly wiped with an old soft silk handkerchief.

All leather should be frequently wiped, and may be slightly oiled with camphorated vaseline.

Examine your cameras inside occasionally to see that they are light tight, and wipe the inside of the bellows, or luminous fungi may collect and fog your plates.

Oil the hinges of the legs of the tripod stand, and clean the points. All trays, &c., should be thoroughly cleaned and wiped after each time of using.

Note.—I have often enlisted native servants and savages, who may be the subjects with whom I am working, to do all this mere manual work of cleaning, and they seldom break things.

Packing.—It is better to use a number of small stout wooden or wicker boxes, than one or two large and heavy ones. Corrugated paper, and crumpled, *not folded*, cloths are capital packing material. Coarse dusters which are used for cleaning the trays can be used for packing. Each bottle or jar should be in a separate compartment. A wisp of hay and paper, wrapped entirely round each bottle, is good.

As regards *lighting*, *backgrounds*, and *studios*, I can say little as circumstances alter cases so much.

Open air groups are more satisfactory on a dull day than when there is brilliant sunshine, on account of the very heavy shadows in the latter case obscuring detail.

In brilliant sunshine in the jungle a very objectionable spotty lighting is often found.

In full face photographs care should be taken that the lighting is even, and not with a high light on one side of the face, and a heavy shadow on the other. A reflector of some white material is here useful to lighten the shaded side of the face.

On no account should the subject face a brilliant sun.

A dull grey or drab background, being unobtrusive, is the best A wall slightly out of focus may be used. If the only available background is foliage, it should be as much out of focus as possible, unless it is essential to the subject. The smoke of a damp leaf fire makes a good background, and is of use in blotting out foliage, &c., which are not required in the photograph.

With a 15-inch by 12-inch camera some sort of studio is a necessity on account of its weight, &c., as the operator will be less fatigued by working under shelter from the sun. A good studio stand will be required, and will be found most useful.

A substitute for a properly constructed studio may be made by building two sheds of matting, facing each other, and walled in on the top, back, and two sides. Coarse blankets could be hung for a background. These sheds might be 10 feet deep and 15 feet apart.

A very good form of studio is a long building, 14 feet high to the eaves, and open from the eaves to the ground on the north side, if north of the Equator, or on the south side if south of it,

In the tropics this is better than a studio with top lights of glass, on account of the heat of the latter.

The ends of the studio may be covered with a drab lime-wash for a background.

A couple of light, white reflectors about 3 feet square, and a good head and body rest will be found of great use in a studio.

In conclusion the following hints may be of some use.

Most of your work will be done with the rapid symmetrical lenses, and the wide angle rectilinear lenses should only be used when you are unable to get sufficiently far away from your subject to use the others, or when a wide angle is required for large groups with no distance in the background. They are also used in the thick jungle.

Keep a note book, and as soon as you can, take a print from each negative, and paste it into the book, writing a detailed description of the facts illustrated. Then, if your negatives are afterwards broken, your work can be reproduced from your note book.

The negatives, when varnished, should be packed in dozens, face to face (as received from the makers), with a piece of blotting paper between each, folded up in paper, tightly tied together, and then put into their original box. These boxes can then be packed away in a case well surrounded by crumpled shavings, or crumpled cloths.

Number all negatives and prints. Fresh arrowroot starch is good for mounting the latter, used as follows :—

After the print has been trimmed, place it on the mount, marking its position with a pencil. Then wet the print on the back until it is wet all through, paste all over the mount, put the print in its place, put a sheet of blotting paper over it, rub it down with a flat squeegee, and then, with a wet sponge, clean off the superfluous paste.

For trimming prints I use a set square and pencil, and then cut along the pencil lines with scissors. This will be found handier in the jungle than glass trimming shapes, and knives which continually require sharpening.

Have a large jar to keep the fixing solution in. Keep some spare stoppered blue glass bottles for the pyro, and small dropping bottles for the bromide. Vermouth bottles are useful for some solutions, being large with clear glass. Put vaseline on all corks and bottle stoppers, and when travelling tie these in.

If your focussing screen is broken, fix a dry plate, without exposing or developing it, and when dry and varnished it can be used as a substitute.

Arrange your negatives systematically. Lock up all apparatus from savages and others, and on no account let your camera get wet. Stick to one make of plates. Learn to count seconds correctly. Have labels or marks on your bottles so that you can distinguish them in the dark room. Overhaul your kit before starting on your day's work, and see all is present and in good order. Do not retouch or add clouds, &c., to scientific photographs.

Having purchased your apparatus, study it before you start, so that you may be a thorough master of it, and of the exposure developing, and printing, &c. (with the formula given), so that the difficulties of the technique of photography will not in any way hinder you, or take your mind off your anthropological work.

A friend recently wrote to me "that there would be plenty of money and people available for anthropological research, when there were no more aborigines."

Could not the Anthropological Institute take an active lead in this matter. A committee chosen from the members resident in England could ascertain exactly what work is required, and could then apportion this work among anthropologists residing in the several countries, and willing to undertake it.

The committee in England would collect funds to purchase collections, and supply apparatus, &c., to those workers who were unable to pay for them, as the Royal Geographical Society does. The results of the work, *i.e.*, the collections and photographs, could be deposited, say, in the British Museum, and the records could be published in the Journal of the Institute.

PORT BLAIR, THE ANDAMAN ISLANDS. M. V. PORTMAN.
18*th May*, 1895. *Officer in charge of the Andamanese.*

SEXUAL INFERIORITY.

BY EDWARD TREGEAR.

AFTER reading the paper by Mr. E. A. Crawley on the "Sexual Taboo" ("Anth. Jour." vol. xxiv, p. 219, *et seq.*), I am emboldened to offer the following remarks, because, without wishing to show eccentricity of thought, I hold that it is good for ethnologists to view all possible sides and aspects of any subject concerning the human race.

Noting the many different ways in which the social inferiority of women appears among the savage and semi-civilised peoples spoken of by Mr. Crawley, I consider that although all the questions arising from the many-sided problem cannot be answered at present, yet that on one of these at least a light may be thrown. The orthodox view of women's lower position is that man, because he is physically stronger than woman, has considered her to be tainted and defiled at certain periods mainly because he, the lordly animal, differs from her in her bodily constitution and sexual weaknesses. It is possible that such an idea may be a mistaken one; that what bears the superficial appearance of haughty cruelty may be the very reverse, and may have had its far off origin in a wise tenderness unrecognised and unappreciated by either sex in later generations.

Just as one of the proofs of the sisterhood of the sciences is that astronomy joins hands with geology and physics to demand an immensely long period through which the childhood of our planet must have passed, so does Anthropology come as another

sister to ask for a longer lapse of time than the six thousand years which as schoolboys we were taught was the world's age. In the vast spaces of time behind history great changes must have taken place in the races of mankind, and it is perhaps more than a guess of the modern scientist when he states that many barbaric or semi-barbaric peoples have at one time known a higher culture. One branch of Anthropology, viz., Philology, asserts that there can be recognised in languages of some races now not civilised and the vicissitudes that have affected words, traces of prior culture and of higher position in ancient days. Is it not possible then that in that night of time some of the barbarian customs of to-day may have had their origin in wise ordinances of kindly-hearted, far-seeing men who clothed their charity for the weak in the garb of religion and of law suited to the character of those with whom they had to deal?

Let us consider the question of the "impurity" of women from this point of view. It is probable that we see it at its best in the ordinances of Moses. The Israelitish woman was set apart, not only at the time of childbirth, but during her monthly periods. She was thus absolved from her usual household work, and had an interval of complete rest at a time when rest is of the highest hygienic value. The great prolific and recuperative power of Jewish women, whereby they have been able to keep their nation numerous and constantly increasing although the victims of centuries of oppression and dispersion, is probably owing to the rest and restoration of the bodily faculties on such occasions. Similarly among savage races, where the women are supposed to be defiled and to defile men and food by their touch at the time when they should be "separated," it may be that such a provision was the wisest and most merciful course possible. Beasts are preserved in their sexual relations by strong and comparatively noble instincts; when men rose sufficiently above the beasts to be no longer guided by instinct they needed restraint to prevent them "monkeying" with the sacred fount of life. That restraint (in my opinion) was given by religion in the case of the Jews and some other peoples, and in regard to savages by custom which is itself a kind of religion or the degraded descendant of a religion. For so long as the women were set apart, not allowed to touch the body or food or clothes of a man, so long was she sexually safe, and so long was the tribal life safe, and only then. What matter whether at such a time she was considered "holy" or "defiled"? The effect was the same, and the word *tabu* (taboo) has both such meanings; a better one still is that of "prohibited."

I put forward this view because as chief inspector of factories for New Zealand, I see, as men of my profession must, constant examples of the evil wrought by long hours of the standing position or of bodily toil on women, not only before and after childbirth but at the monthly period. If every woman could have a week out of every month during which she could cease to work (or better still, go to bed), we should have a far stronger generation

to succeed the present. Such a state of things is, I know, impossible in the present condition of industry and of society, but those men who were wise enough and strong enough to throw the ægis of religion and even of prejudice over the weaker sex in ancient days could teach valuable lessons to ourselves with all our pride of learning and discovery. Having lived much among savages I have learnt many lessons from them, I am not ashamed to say; and not the least was that the "defiled" woman of the barbarians has a time of recuperation allowed her which is denied to those of her sisters who dwell under the mock chivalry of civilisation.

"A History of the Hebrews." By R. Kittel. Translated by John Taylor. (Williams and Norgate.) Vol. i. pp. 312. 8vo. 1895. This is an English translation, with additions, of Prof. Kittel's German work on the Hebrews, two volumes of which were published in 1888 and 1892. The work is an attempt "to write the history of the ancient *Hebrew* people, from their first beginnings up to the time when, first in Babylonia and then in Palestine, they pass over into the small community of *Judaism*." The present volume contains sources of information and history of the period up to the death of Joshua.

"Ancient Rome and its Neighbourhood;" an illustrated handbook to the ruins in the City and Campagna. By Robert Burn. (George Bell and Sons.) pp. 292. 8vo. 1895. A guide for archæologists and travellers to the ruins of Rome and its neighbourhood. The volume is profusely illustrated and contains some good plans and maps which make it easy to discover the whereabouts of the many ruins.

"England's Mission to India;" some impressions from a recent visit. By the Right Rev. Alfred Barry. (Society for Promoting Christian Knowledge.) pp. 214. 12mo. 1895. The contents of this volume are:—Impressions of Indian Life; the advance of Material Civilisation: the advance of Intellectual Civilisation; the advance of Moral Civilisation, and the advance of Religious Civilisation.

"Mental Development in the Child and the Race," Methods and Processes. By James Mark Baldwin. (Macmillan and Co.) 8vo. 1895. pp. 496. This book is divided into sixteen chapters, i–vi of which "are devoted to the statement of the genetic problem, with reports of the facts of infant life and the methods of investigating them, and the mere teasing out of the strings of law on which the facts are beaded—the principles of Suggestion, Habit, Accommodation, &c. Chapter v gives a detailed analysis of one voluntary function, Handwriting. The theory of adaptation is stated in general terms in chapters vii and viii, and chapters ix–xvi are devoted to a genetic view in detail of the

progress of mental development in its great stages, Memory, Association, Attention, Thought, Self-consciousness, Volition."

"**Primer of South African History.**" From original research in the Archives of Great Britain, the Netherlands, and the Cape Colony. By G. McCall Théal. (Fisher Unwin.) 8vo. 1895. pp. 139. A brief account of the territories of South Africa, with a list of the principal events from 1486 to 1895. The names of the leaders of the Cape Government from 1652 to 1895 are given.

"**A Comparative Vocabulary of the Dialects of British New Guinea.**" Compiled by Sidney H. Ray, with a preface by Dr. R. N. Cust. (Society for Promoting Christian Knowledge.) pp. 40. 8vo. 1895. A comparative list of fifty-two dialects which are shown to fall practically into twenty-five languages. A map illustrative of the New Guinea languages accompanies the volume.

"**The Story of 'Primitive' Man.**" By Edward Clodd. (George Newnes, Ltd.) pp. 206. 12mo. 1895. This volume gives an outline of man's early history, his place in the Earth's Life-history, his place in the Earth's Time-history, an account of the Ancient Stone Age, the Newer Stone Age, and the Age of Metals. The volume is fully illustrated, contains a list of authorities consulted, and has a good index.

"**An English-Zulu Dictionary;**" with the principles of Pronunciation and Classification fully explained. By Rev. Charles Roberts. 2nd edition, with supplement. (Kegan Paul.) pp. 267. 8vo. 1895. Contains Zulu for about 18,000 English words, and therefore will be of much value to students of the language.

"**Reason and Religion,**" or the leading Doctrines of Christianity. By the Rev. R. E. Hooppell. 2nd edition. (Henry Frowde.) pp. 200. 8vo. 1895. A course of sermons giving a connected view of the teachings of Christianity.

"**The Great Dominion: Studies of Canada.**" By George R. Parkin. (Macmillan.) pp. 251. 8vo. 1895. The greater part of the matter contained in this volume appeared originally in the "Times." It "touches upon the most significant conditions of Canadian life, the most important of the problems which confront Canadians, and those external relations which have the greatest general interest." Three good maps accompany the volume.

"**The American Commonwealth.**" By James Bryce. 3rd edition. (Macmillan and Co.) 2 vols. pp. 724, 904. 8vo. 1895. This work gives a detailed account of the American Commonwealth—the National Government, the State Governments, the Party System, Public Opinion, Illustrations and Reflections

and Social Institutions. This edition has been revised throughout, and all difficult and controverted points have been reconsidered, the constitutional changes in the States since 1889 have been noted, and the figures of population have been corrected by the census returns of 1890, those relating to education by the latest available Report of the Bureau of Education.

"The History of Greece," from its commencement to the close of the Independence of the Greek nation. By Adolph Holm. (Macmillan and Co.) Vols. i, ii. pp. 432, 535. 8vo. 1894–95. This work is a translation from the German and will be completed in four volumes. The first volume takes in the history of Greece up to the end of the sixth century B.C., and the second volume gives a history of the fifth century B.C. So far as we can judge from the two volumes before us the whole work will furnish us with a pretty complete history of the Greek nation.

"The Peoples and Politics of the Far East;" travels and studies in the British, French, Spanish and Portuguese Colonies, Siberia, China, Japan. Korea, Siam and Malaya. By Henry Norman. (T. Fisher Unwin.) 8vo. 1895. pp. 608. This book is, as the author tells us, the result of nearly four years of travel and study in the countries and colonies of which it treats. As the author has only described and discussed the places that he actually visited, and as his information was derived from the local authorities and best-informed residents, the accounts of the different localities may be accepted as reliable. It is a well got up volume, and contains sixty illustrations and four maps.

"The Zulu-Kafir Language," simplified for beginners. By the Rev. Charles Roberts. 3rd edition. (Kegan Paul and Co.) pp. 177. 8vo. 1895. This book is arranged on the author's own lines, which experience has induced him to believe is best for beginners. It seems to us a useful book for the purposes for which it is intended.

"The American Commercial Policy," three historical essays. By Ugo Rabbeno. 2nd edition. Translated at the Translations Bureau, London. (Macmillan and Co.) pp. 414. 8vo. 1895. The titles of the three essays in this volume are:—The English Commercial Policy in the North American Colonies; the causes of the Commercial Policy of the United States; and the Theory of Protectionism in the United States and the Historical Circumstances of its Development. These essays explain certain facts which during a long period of time have been taking place in the United States, and from them conclusions are drawn which, though as yet only referable to that country, may perhaps after other researches be also applicable to other nations.

"The Chinaman in his own Stories." By Thomas G. Selby. (Charles H. Kelly.) pp. 210. 8vo. 1895. Translations of

Chinese stories published with the idea of giving a brief glance at Chinese life through Chinese fiction.

"**On certain phenomena belonging to the close of the last Geological Period,**" and on their bearing upon the Tradition of the Flood. By Joseph Prestwich. (Macmillan and Co.) pp. 87. 8vo. 1895. Arguments and evidence in favour of the hypothesis of a comparatively recent submergence of Western Europe, and of the Mediterranean coasts.

"**Outlines of Roman History**" from 133 to 27 B.C. By A. H. Allcroft and W. F. Masom. (W. B. Clive.) pp. 287–400. This is a reprint from the "Tutorial History of Rome," and forms a useful volume of the "University Tutorial Series."

"**The Story of Africa and its Explorers.**" By Robert Brown, M.A., Ph.D., &c. (Cassell and Co.) Vols. i.–ii. pp. 312, 312. 4to. 1892–93. This adds another to the list of Dr. Brown's very readable works. The contents of the two volumes before us are (vol. i) the Guinea Traders, the Corsairs of Africa; the tale of Timbuctoo; the Niger: (vol. ii) the river of Egypt; the Great Lakes; across the Continent; the Congo. Every chapter is copiously illustrated with scenes, maps, plans of localities, natives, &c.

"**The American Antiquarian.**" Vol. xvii. No. 2. The Hidery Story of Creation, by J. Deans. Notes on the Kootenay Indians, by A. F. Chamberlain. An Aboriginal War Club, by J. Wickersham. Palestine Exploration, by T. F. Wright. Anthropomorphic Divinities, by S. D. Peet. Prehistoric contact of Americans with Oceanic peoples, by Prof. C. Thomas. The silver vessel from Gundestrup; and Ethnographic and Literary Notes.

"**The Journal of Mental Science.**" Vol. xli. No. 173. A review of the influence of Reflex and Toxic agencies in the Causation of Insanity and Epilepsy, by F. St. J. Bullen. Lunacy Administration in Berlin and in Scotland, with special reference to the care of the Insane in Private Dwellings, by J. Sibbald. Impressions of a flying visit to a Dutch asylum, by M. D. Macleod. The Spastic and Tabetic types of general paralysis, by R. S. Stewart. Tuberculosis Disease and its treatment in Irish asylums, by Dr. Finegan. The effect upon Mental Disorders of intercurrent bodily disease, by E. Goodall and F. St. J. Bullen. The relationship between general Paralysis and chronic Renal Disease, by H. C. Bristowe. The breaking strain of the ribs of the Insane, by A. W. Campbell. Current opinion on Medico-Psychological questions in Germany, as represented by Prof. L. Meyer, of Göttingen, by A. R. Urquhart.

"**L'Anthropologie.**" Tome vi. No. 3. General considerations on the Yellow Races, by Dr. E. T. Hamy. Infantilism, Feminism,

and the ancient Hermaphrodites, by H. Meige. Studies in prehistoric ethnography, by E. Piette. Sculpture in Europe before the Greco-Roman influences, by S. Reinach.

"**Transactions and Proceedings of the Japan Society.**" Vol. ii. Pt. 2. The influence of Europe on the Art of Old Japan, by M. B. Huish. The family relations in Japan, by Consul Daigoro Goh.

"**Journal of the Royal Institution of Cornwall.**" Vol. xii. Pt. 1. Mullion Island, by H. Fox. The new Californian stamps at Dolcoath mine, by J. Thomas. The climate of West Cornwall, by E. Kitto. On the origin and development of Ore Deposits in the West of England, by J. H. Collins. The Rude Stone Monuments of Cornwall, by R. N. Worth. Notes on Duloe Circular Enclosure, by Rev. W. Iago. Recovery of a Lost Ring, communicated by Rev. Canon Saltren Rogers. Inscribed Stones of Cornwall, by Rev. W. Iago.

"**The American Anthropologist.**" Vol. viii. No. 1. Stone Art in America, by J. W. Powell. The Huacos of Chira Valley, Peru, by S. M. Scott. Caste in India, by J. H. Porter. Micmac Customs and Traditions, by S. Hager. The writings of Padre Andres de Olmos in the languages of Mexico, by J. C. Pilling. Chinese Origin of Playing Cards, by W. H. Wilkinson.

"**Journal of the Asiatic Society of Bengal.**" Vol. lxiii. Pt. 1. No. 4, and vol. lxi, extra number. (No. 4.) On the Hypothesis of the Babylonian origin of the so-called Lunar Zodiac, by G. Thibaut. Further observations on the History and Coinage of the Gapta period, by V. A. Smith, and note by Dr. A. F. R. Hoerne. The Tribes, Clans, and Castes of Nepāl, by Captain E. Vansittart. (Extra No.) The Mihrán of Sind and its tributaries; a Geographical and Historical Study, by Major H. G. Raverty.

"**Revue Mensuelle de l'Ecole d'Anthropologie.**" Ann. v. Nos. iv–vi. (iv.) Asia, by Fr. Schrader. Notes on the Ethnology of the Morvan, by Ab. Hovelacque, and G. Hervé. (v.) Lacustrine populations, by G. Hervé. Indexing Galic Neolithic Crania, by Ph. Salmon. (vi.) Sentiments and Knowledge, a course of Physiological Anthropology, by L. Manouvrier. Prehistoric Ethnology, by Ph. Salmon.

"**The Scottish Geographical Magazine.**" Vol. xi. Nos. 4–6. (4.) British New Guinea, by Sir W. MacGregor. Beira, by A. C. Ross. On the areas of the land and water of the Globe, by H. Wagner. (5.) Manchuria, by Rev. J. Ross. The "Challenger" Expedition. Arctic Research before Franklin, by W. S. Dalgleish. M. Elisée Reclus, and the "Geographie Universelle." The Caucasian Highlands: a Physical, Biological, and Ethnographical

sketch of Svanetia, by V. Dingelstedt. The Baltic and North Sea Canal.

"**Proceedings of the Society of Biblical Archæology.**" Vol. xvii. Pt. 4. The Book of the Dead, by P. Le Page Renouf. The name Shinar, Genesis xi, 2; and the meaning of זמרת in Genesis xliii, 11, by Rev. C. J. Ball. Some Assyrian Alliterative Texts, by S. A. Strong. Inscription of the time of Amenophis, by Dr. A. Wiedemann.

In consequence of the proof of an important paper having to be forwarded to Central Africa for correction the *Journal* for February may be delayed.